PIONEER®
*The Art of Entertainment*

# Service Manual

·CDX-P610

**ORDER NO.**
**CRT1632**

The chapter 1 of this Service Manual will not be reprinted. On your additional orders, we may supply only the chapter 2. For the chapter 1, please make copies and attach to the chapter 2 at your side if necessary.

**MULTI-COMPACT DISC PLAYER**

# CDX-P616 UC
# CDX-P610 UC,EW,ES
# CDX-P610 X1B/EW

● **See the separate manual CX-624 (CRT1631) for the CD mechanism description and disassembly.**

● **The CD mechanism employed in this model is one of CX-624 series.**

## SPECIFICATIONS

General
System ..... Compact disc audio system
Usable discs ..... Compact Disc
Signal format ..... Sampling frequency: 44.1 kHz
Number of quantization bits: 16; linear
Power source ..... 14.4 V DC
(10.8 - 15.6 V allowable)
Max. current consumption ..... 1.0 A
Weight ..... 2.4 kg (5.3 lbs.)
Dimensions ..... 275 (W) × 69 (H) × 155 (D) mm
[10-7/8 (W) × 2-3/4 (H) × 6-1/8 (D) in.]

Audio
Frequency characteristics ..... 5 - 20,000 Hz ( 1 dB)
Signal-to-noise ratio ..... 92 dB (1 kHz) (IHF-A Network)
Distortion ..... 0.006 %
Dynamic range ..... 90 dB (1 kHz)
Output level ..... 1,000 mV (1 kHz, 0 dB)
Number of channels ..... 2 (stereo)

These specifications were determined and are presented in accordance with specification standards established by the Ad Hoc Committee of Car Stereo Manufacturers.
Note:
Specifications and design are subject to possible modification without prior notice due to improvements.

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# CHAPTER 1

## 1. SAFETY INFORMATION

### 1.1 CDX-P616/UC,P610/UC

**CAUTION**

This service manual is intended for qualified service technicians; it is not meant for the casual do-it-yourselfer.
Qualified technicians have the necessary test equipment and tools, and have been trained to properly and safely repair complex products such as those covered by this manual.
Improperly performed repairs can adversely affect the safety and reliability of the product and may void the warranty.
If you are not qualified to perform the repair of this product properly and safely; you should not risk trying to do so and refer the repair to a qualified service technician.

**WARNING**

Lead in solder used in this product is listed by the California Health and Welfare agency as a known reproductive toxicant which may cause birth defects or other reproductive harm (California Health & Safety Code, Section 25249.5).
When servicing or handling circuit boards and other components which contain lead in solder, avoid unprotected skin contact with the solder. Also, when soldering do not inhale any smoke or fumes produced.

### 1.2 CDX-P610/EW,X1B/EW

**1. Safety Precautions for those who Service this Unit.**

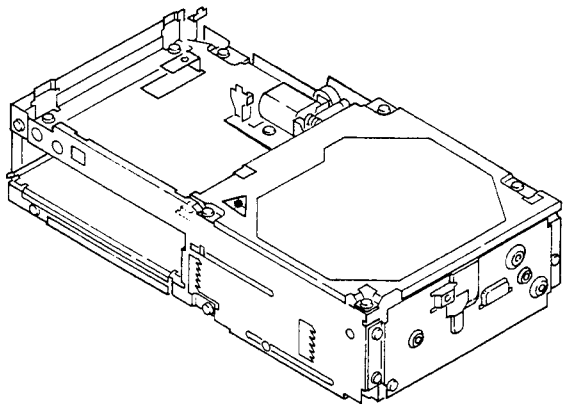
- **Follow the adjustment steps (see pages 1-5 through 1-14)in the service manual when servicing this unit. When checking or adjusting the emitting power of the laser diode exercise caution in order to get safe, reliable results.**

**Caution:**

1. **During repair or tests, minimum distance of 13cm from the focus lens must be kept.**
2. **During repair or tests, do not view laser beam for 10 seconds or longer.**

**2. A "CLASS 1 LASER PRODUCT" label is affixed to the rear of the player.**

**3. The triangular label is attached to the mechanism unit frame.**



**4. Specifications of Laser Diode**

Specifications of laser radiation fields to which human access is possible during service.
Wavelength = 785 nanometers
Radiant power = 69.7 microwatts(Through a circular aperture stop having a diameter of 80 millimeters)
0.55 microwatts(Through a circular aperture stop having a diameter of 7 millimeters)

# 1. EXPLODED VIEW

● **Magazine Assy(CXA5483)**

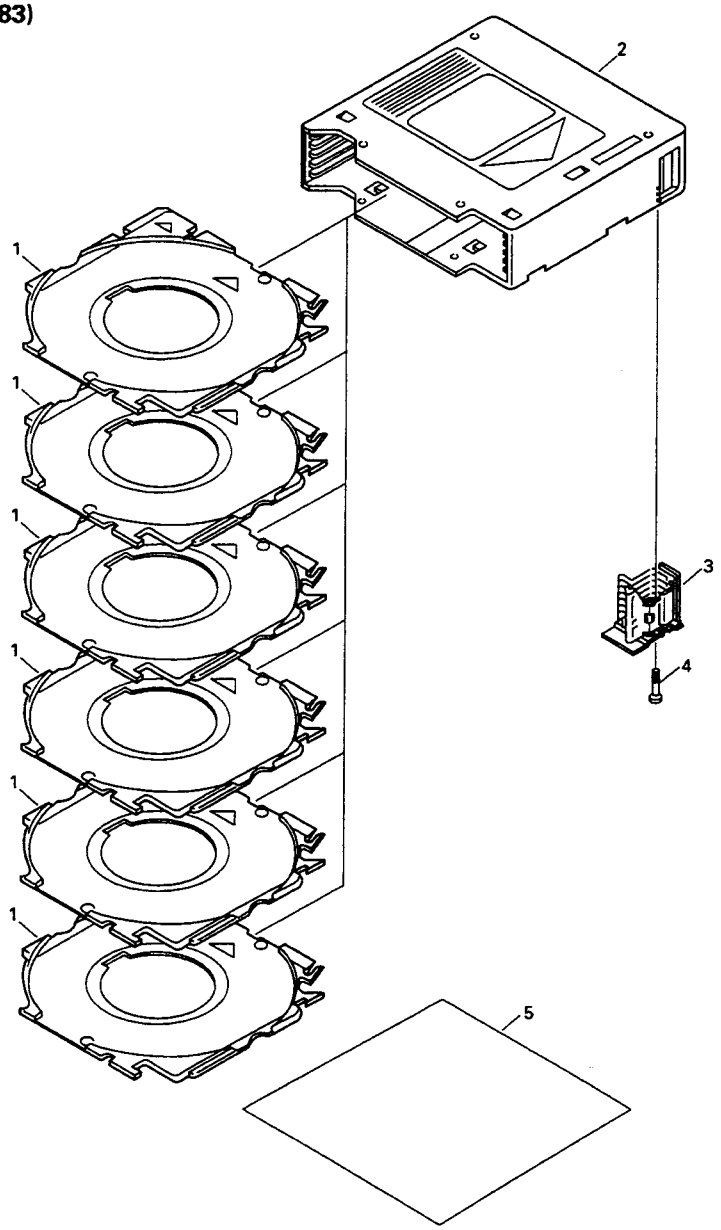



Fig.1

● **Parts List**

| Mark No. | Description | Part No. |
|---|---|---|
| 1 | Tray Unit | CXA5484 |
| 2 | Case Unit | CXA5479 |
| 3 | Bracket Assy | CXA5480 |
| 4 | Screw(M2×13) | CBA1272 |
| 5-1 | Owner's Manual | CRD1639 |
| 5-2 | Label | CRW1248 |

● **CD Mechanism Unit(Parts List:Page 1-40)**

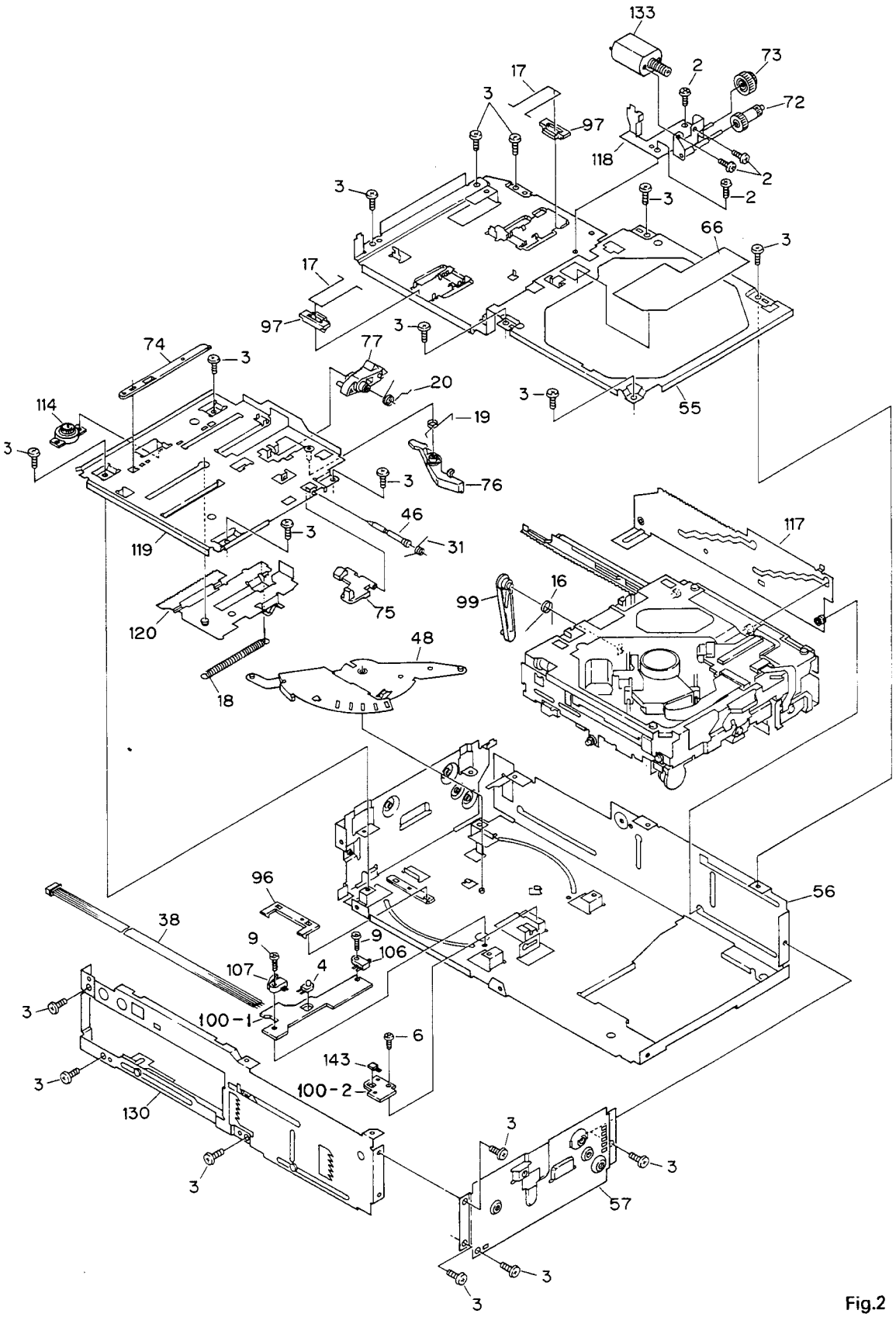
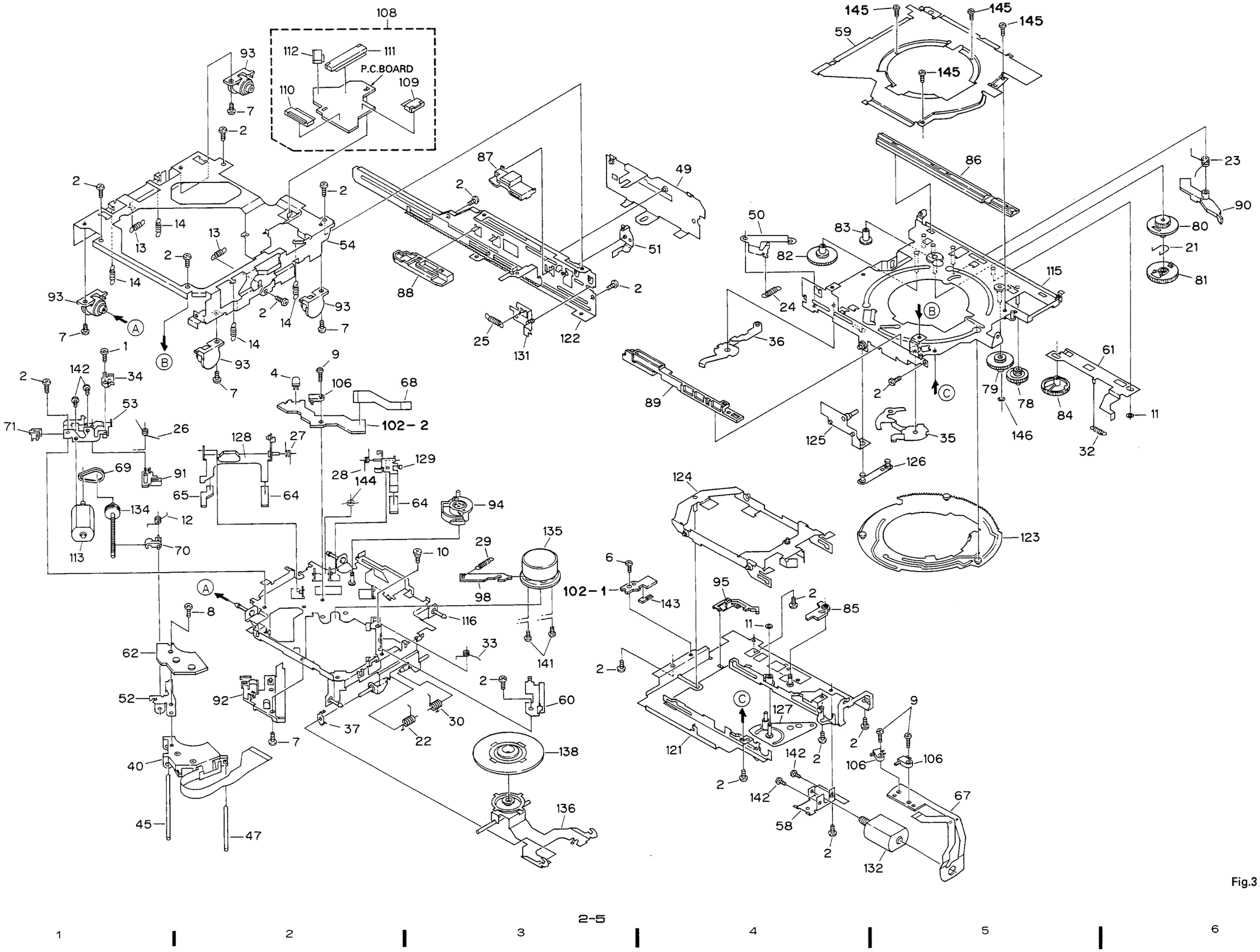



Fig.2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P.C.BOARD
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102-2
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68
4
9
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A
B
C
D
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86
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80
21
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83
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115
36
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61
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146
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35
126
124
123
102-1
143
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95
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127
121
142
58
67
106
132

Fig.3

● **Chassis(Parts List:Page 1-39)**

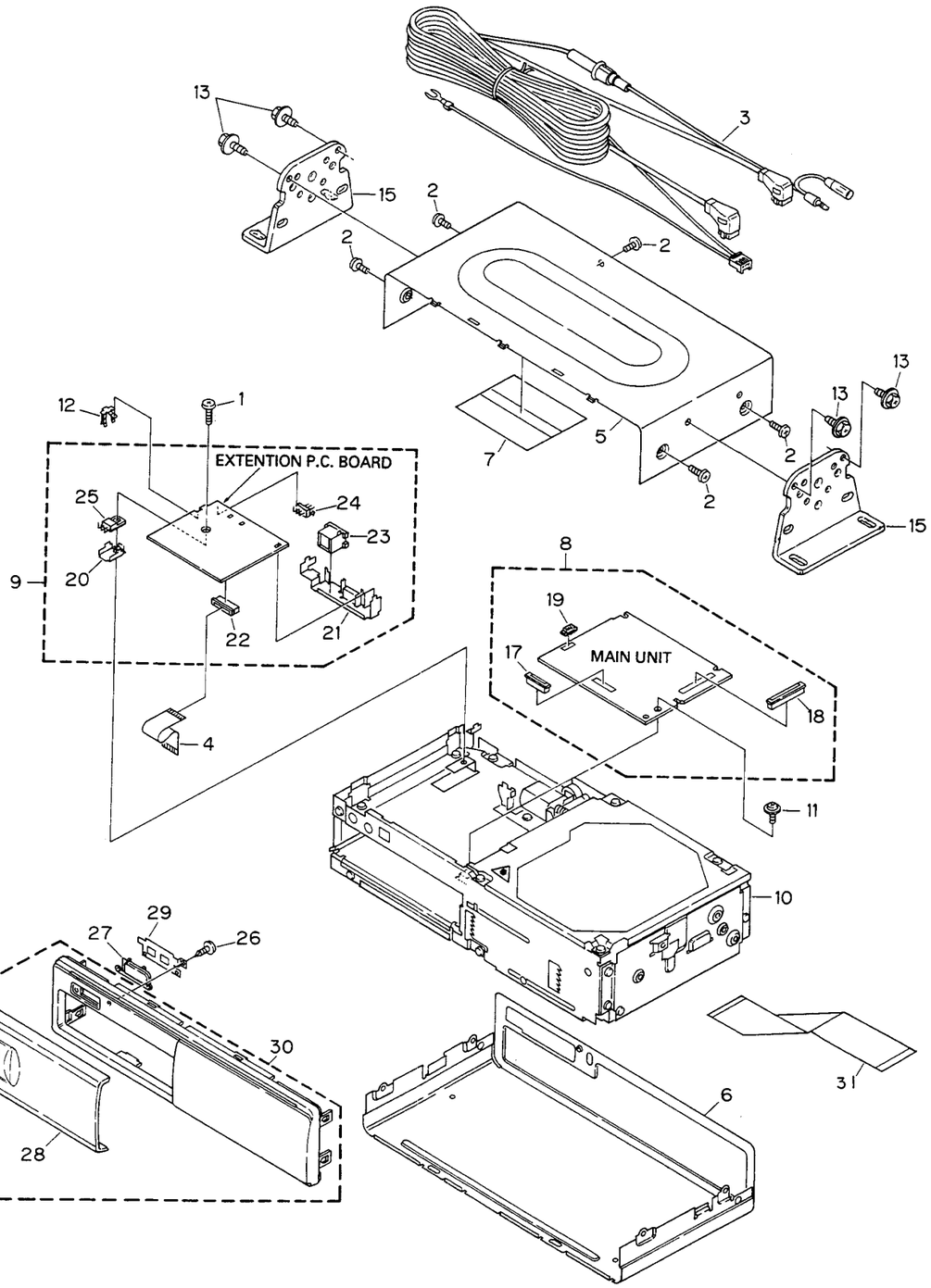



Fig.4

## 2. PACKING METHOD

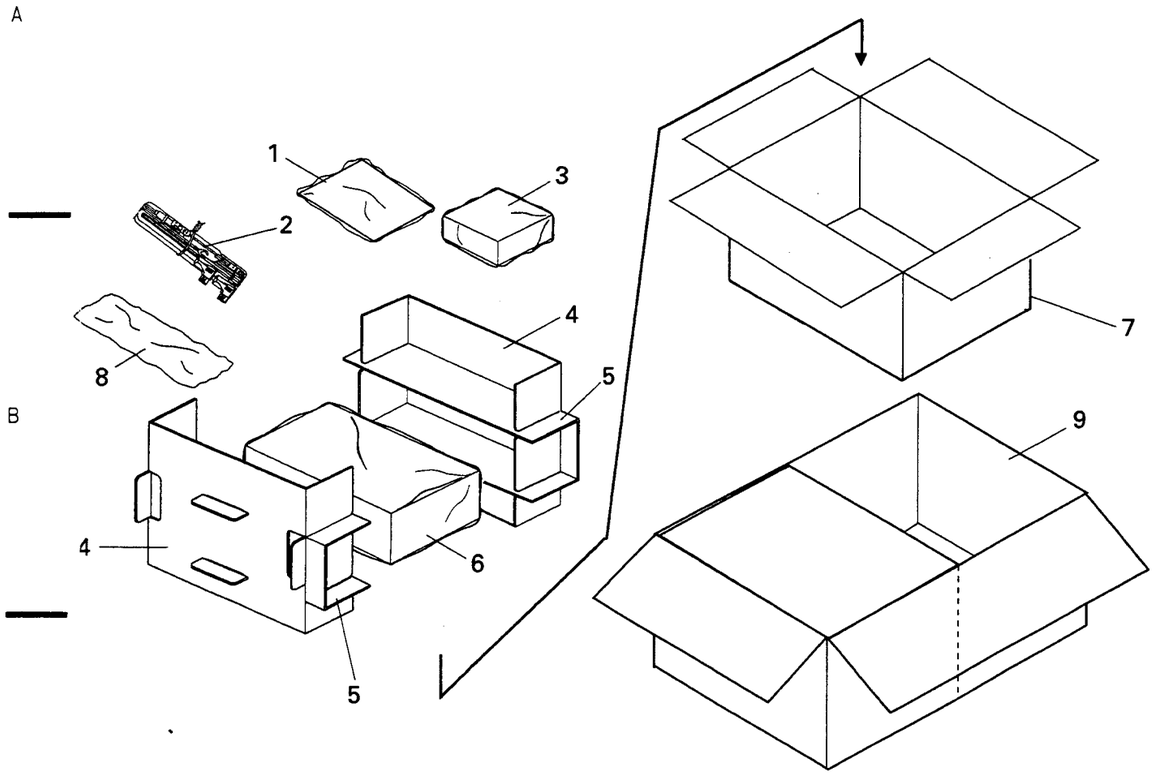


Fig.5

## ● Parts List(CDX-P616/UC)

| Mark | No. | Description | Part No. |
|---|---|---|---|
| | 1-1 | Polyethylene Bag | CEG1116 |
| | 1-2 | Owner's Manual | CRD1780 |
| * | 1-3 | Warranty Card | CRY1070 |
| | 2 | Cord | CDE4211 |
| | 3 | Magazine Assy | CXA5483 |
| | 4 | Protector | CHP1662 |
| | 5 | Protector | CHP1661 |
| | 6 | Polyethylene Bag | CEG1174 |
| | 7 | Carton | CHG2510 |
| | 8 | Accessory Assy | CEA2019 |

| Mark | No. | Description | Part No. |
|---|---|---|---|
| | 8-1 | Screw Assy | CEA1962 |
| | 8-1-1 | Screw(×4) | CBA1295 |
| * | 8-1-2 | Polyethylene Bag | E36-615 |
| | 8-1-3 | Screw(×4) | HMB60P500FMC |
| | 8-1-4 | Screw(×4) | HMF40P080FZK |
| | 8-1-5 | Nut(×4) | NF60FMC |
| | 8-2 | Angle(×2) | CNB1874 |
| * | 8-3 | Polyethylene Bag | E36-634 |
| | 9 | Contain Box | CHL2510 |

*:Non spare part

• The CDX-P610/UC,EW,ES and CDX-P610/X1B/EW Parts Lists enumerate the parts which differ from those enumerated in the CDX-P616/UC Parts List only. The parts other than those enumerated in the former are identical with those in the latter, to which you are requested to refer, accordingly. The CDX-P616/UC Parts List is given on page 2-9.

| Mark | No. | Description | CDX-P616/UC Part No. | CDX-P610/UC Part No. | CDX-P610/EW Part No. | CDX-P610/ES Part No. | CDX-P610/X1B/EW Part No. |
|---|---|---|---|---|---|---|---|
| | 1-1 | Polyethylene Bag | CEG1116 | CEG1116 | CEG1116 | ••••• | *UEG-004 |
| | 1-2 | Owner's Manual | CRD1780 | CRD1778 | CRD1777 | CRD1779 | CRD1777 |
| | | | | | CRD1776 | | CRD1776 |
| * | 1-3 | Warranty Card | CRY1070 | ••••• | CRY1071 | ••••• | URY-001 |
| | 2 | Cord | CDE4211 | CDE4211 | CDE4210 | CDE4211 | CDE4210 |
| | 6 | Polyethylene Bag | CEG1185 | CEG1185 | CEG1042 | CEG1042 | UEG-003 |
| | 7 | Carton | CHG2510 | CHG2508 | CHG2507 | CHG2509 | CHG2507 |
| | 9 | Contain Box | CHL2510 | CHL2508 | CHL2507 | CHL2509 | CHL2507 |
| * | | Card | ••••• | ARY1048 | ••••• | ••••• | ••••• |

## ● Owner's Manual

| Part No. | Model | Language |
|---|---|---|
| CRD1776 | CDX-P610/EW | English,Italian,French,German,Dutch |
| CRD1777 | CDX-P610/EW | Spanish,Portuguese,Swedish,Norwegian,Finnish |
| CRD1778 | CDX-P610/UC | English,French |
| CRD1779 | CDX-P610/ES | English,French,German,Spanish,Arabic |
| CRD1780 | CDX-P616/UC | English,French |

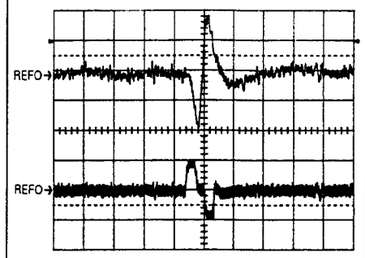


Note: 1. The encircled numbers denote measuring pointes in the circuit diagram.
2. Reference voltage
REFO: 2.5V

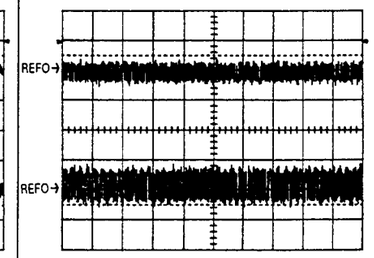
## ● Waveforms

① RFO 0.5V/div. 0.2µs/div.
Normal mode: play

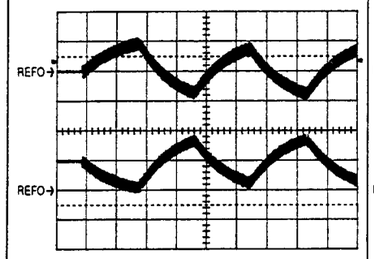
④ CH1: TEY 0.5V/div.
⑤ CH2: TIN 1V/div. 0.5ms/div.
Test mode: Single jump (FWD)



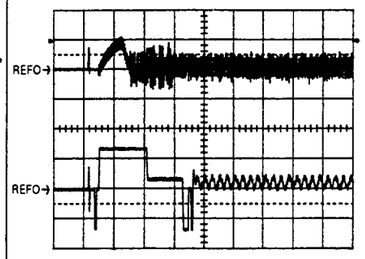

④ CH1: TEY 0.5V/div.
⑤ CH2: TIN 0.5V/div. 20ms/div.
Normal mode: Play



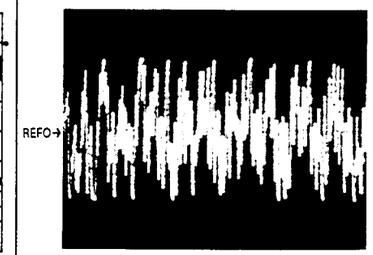

② CH1: FIN 1V/div.
③ CH2: FO+ 2V/div. 0.2s/div.
Test mode: No disc, Focus close



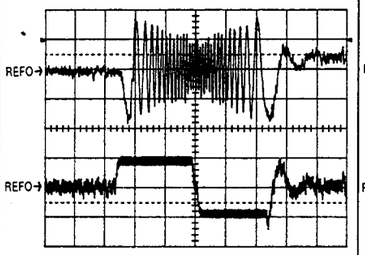

② CH1: FIN 1V/div.
⑦ CH2: SIN 1V/div. 0.5s/div.
Normal mode: Focus close (12cm)



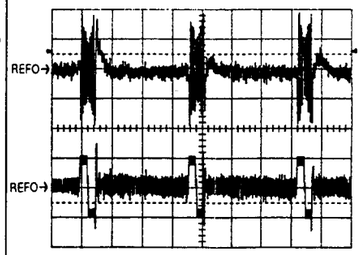

⑦ SIN 0.5V/div. 10ms/div.
Search (12cm disc)



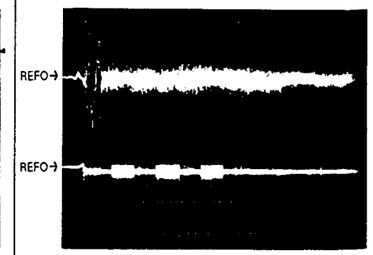

④ CH1: TEY 0.5V/div.
⑤ CH2: TIN 1V/div. 0.5ms/div.
Test mode: 32 track jump (FWD)



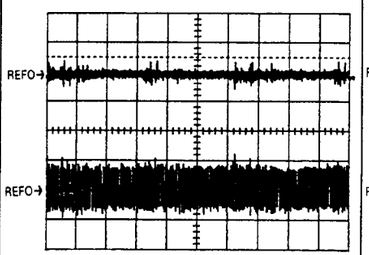

④ CH1: TEY 0.5V/div.
⑤ CH2: TIN 1V/div. 5ms/div.
Test mode: 100 track jump (FWD)



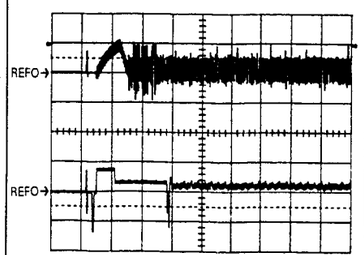

④ CH1: TEY 0.5V/div.
⑥ CH2: FEY 0.5V/div. 0.1s/div.
Normal mode: AGC after focus close



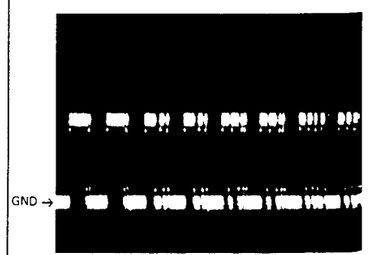

⑥ CH1: FEY 0.2V/div.
② CH2: FIN 0.5V/div. 20ms/div.
Normal mode: Play



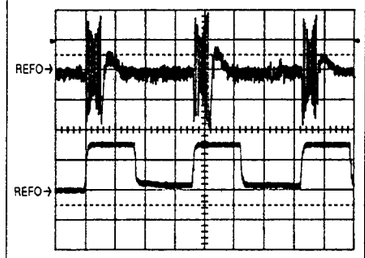

② CH1: FIN 1V/div.
⑦ CH2: SIN 1V/div. 0.5s/div.
Normal mode: Focus close (8cm)



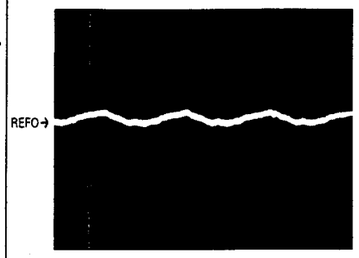

⑫ DATA 2V/div. 10µs/div.
Play



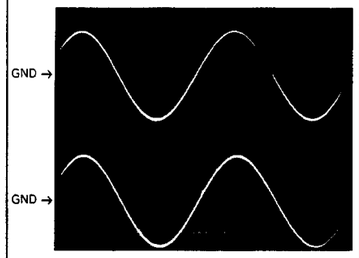
④ CH1: TEY 0.5V/div.
⑧ CH2: CIN 0.5V/div. 5ms/div.
Test mode: 100 track jump (FWO)



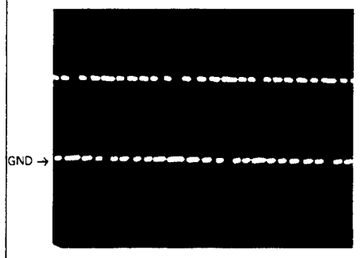

⑦ SIN 0.5V/div. 50ms/div.
Normal mode: 1Play (12cm disc)



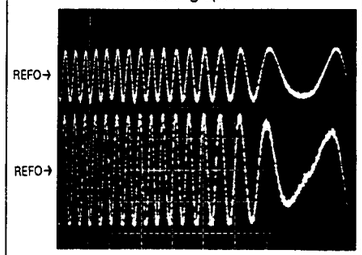

⑭ CH1: R OUT 1V/div.
⑮ CH2: L OUT 1V/div. 0.2ms/div.
Normal mode: Play (1kHz 0dB)



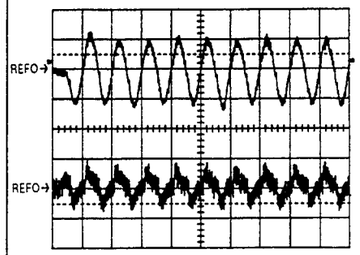

⑨ EFM 2V/div. 5µs/div.
Play



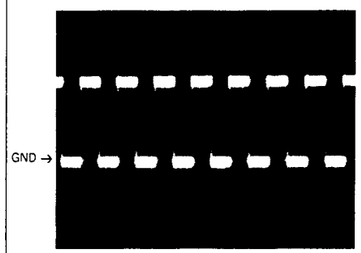

④ CH1: TEY 1V/div.
⑩ CH2: TEC 1V/div. 2ms/div.
Test mode: Focus closed
Tracking open



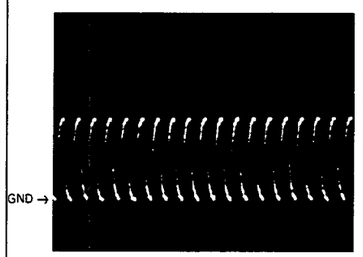

⑥ CH1: FEY 0.2V/div.
② CH2: FIN 1V/div. 1ms/div.
Normal mode: During AGC



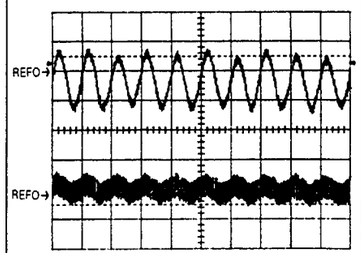

⑬ LRCK 2V/div. 20µs/div.
Play



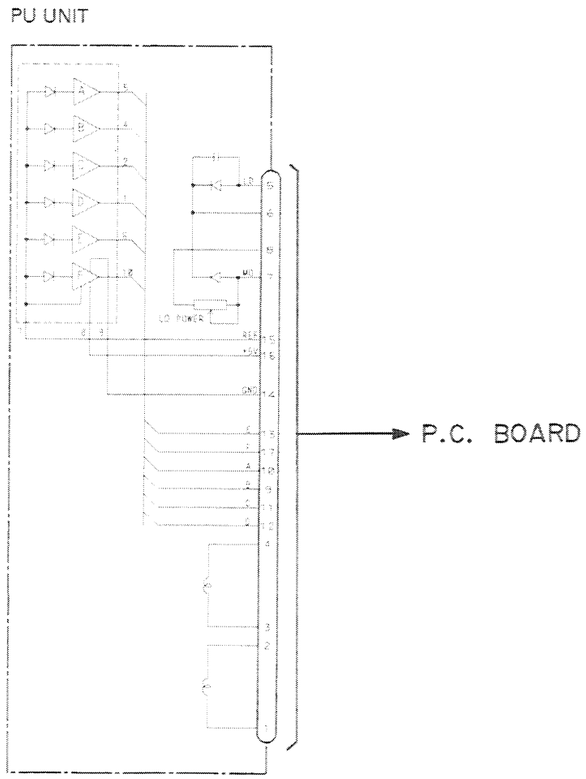

⑪ SCKO 2V/div. 1µs/div.
Play

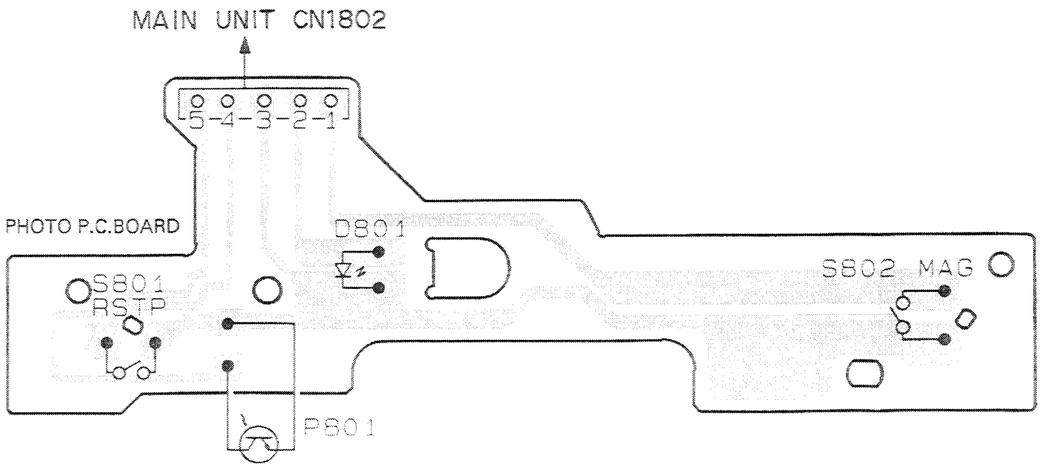


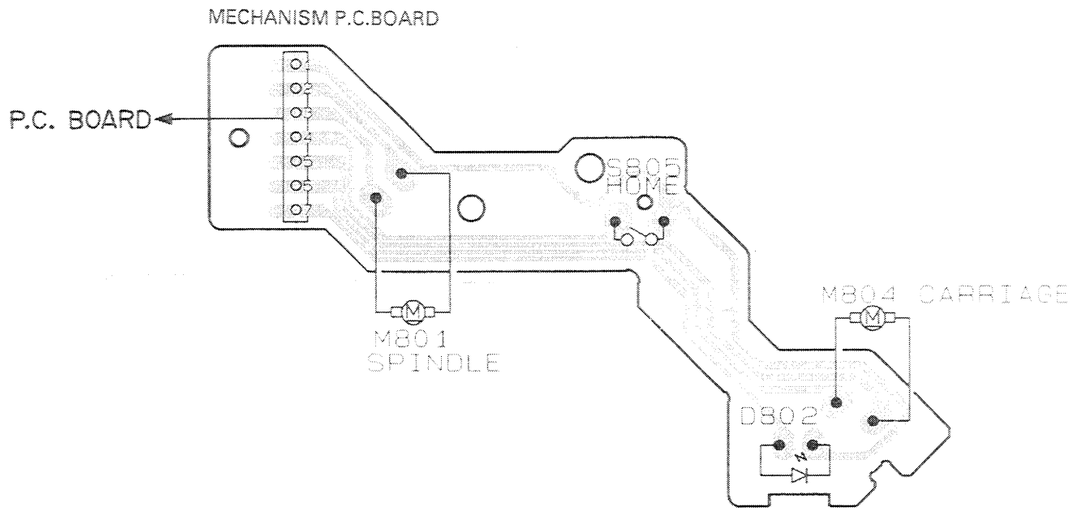

④ CH1: TEY 0.5V/div.
⑤ CH2: TIN 0.5V/div. 1ms/div.
Normal mode: During AGC

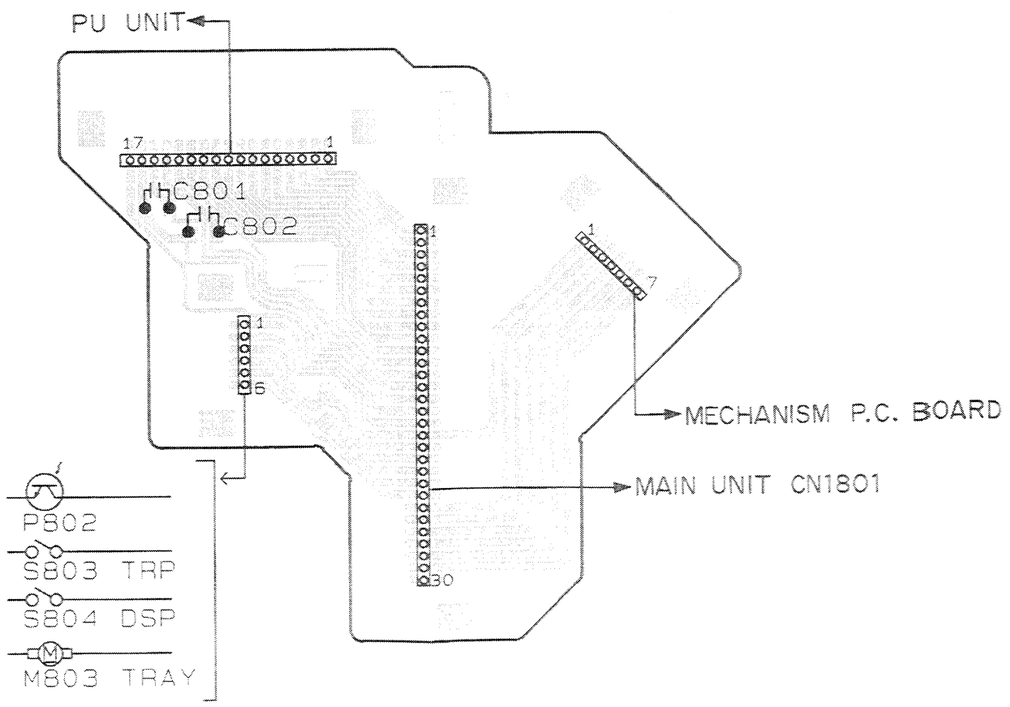


## 3. CONNECTION DIAGRAM(1)



ARRIAGE

)

CHANISM P.C. BOARD

NIT CN1801

IC, Q | ADJ

VR1001
VR1002
VR1003
VR1004

IC1801 Q1801
Q1802 IC1702

Q1701
IC1001

IC1201 IC1701

Q1001

IC1703

IC1601 IC1603 Q1703

Q1708 Q1704

Q1707

IC1401 IC1301 Q1709
IC1602

IC1704

Q1401

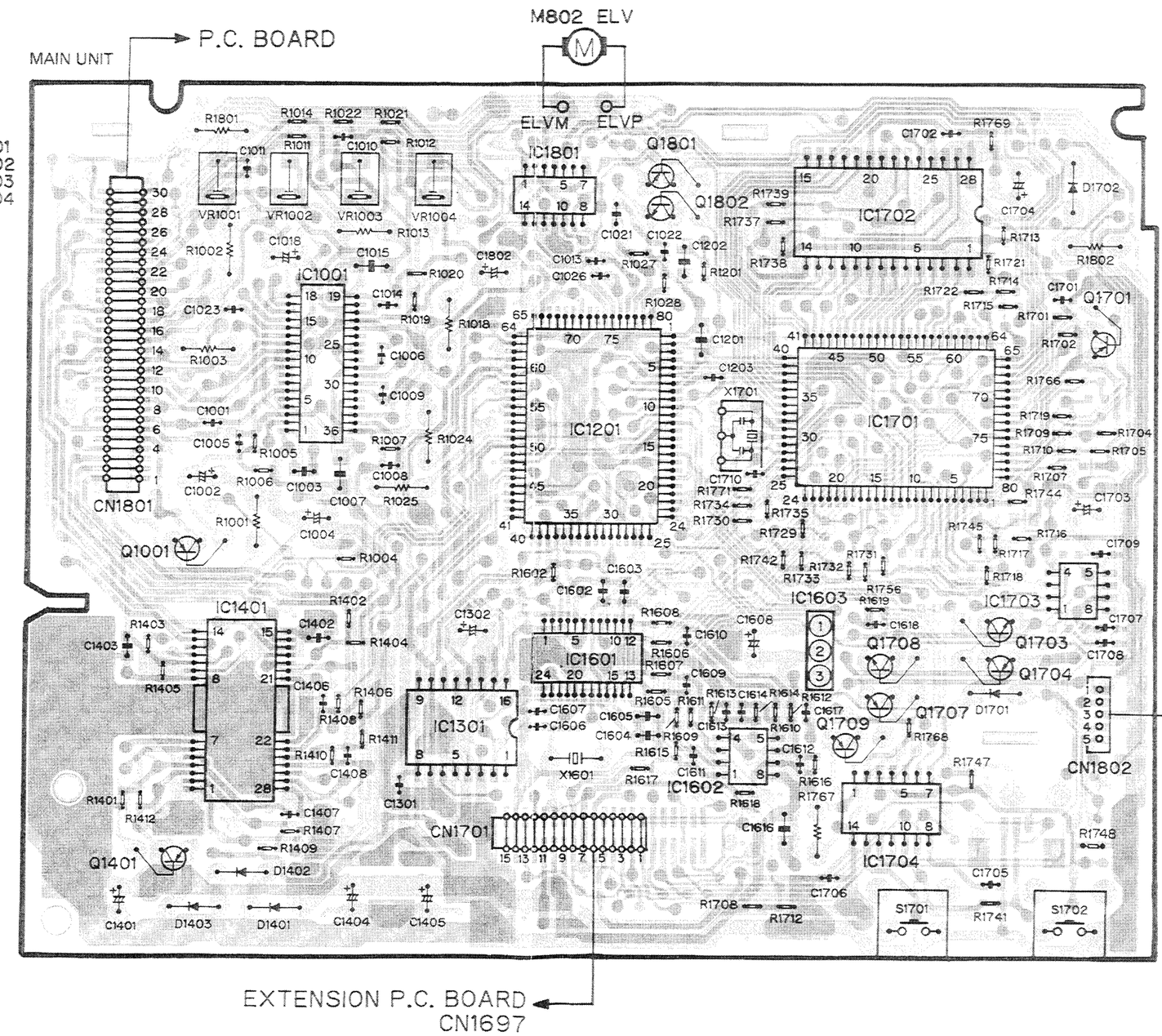
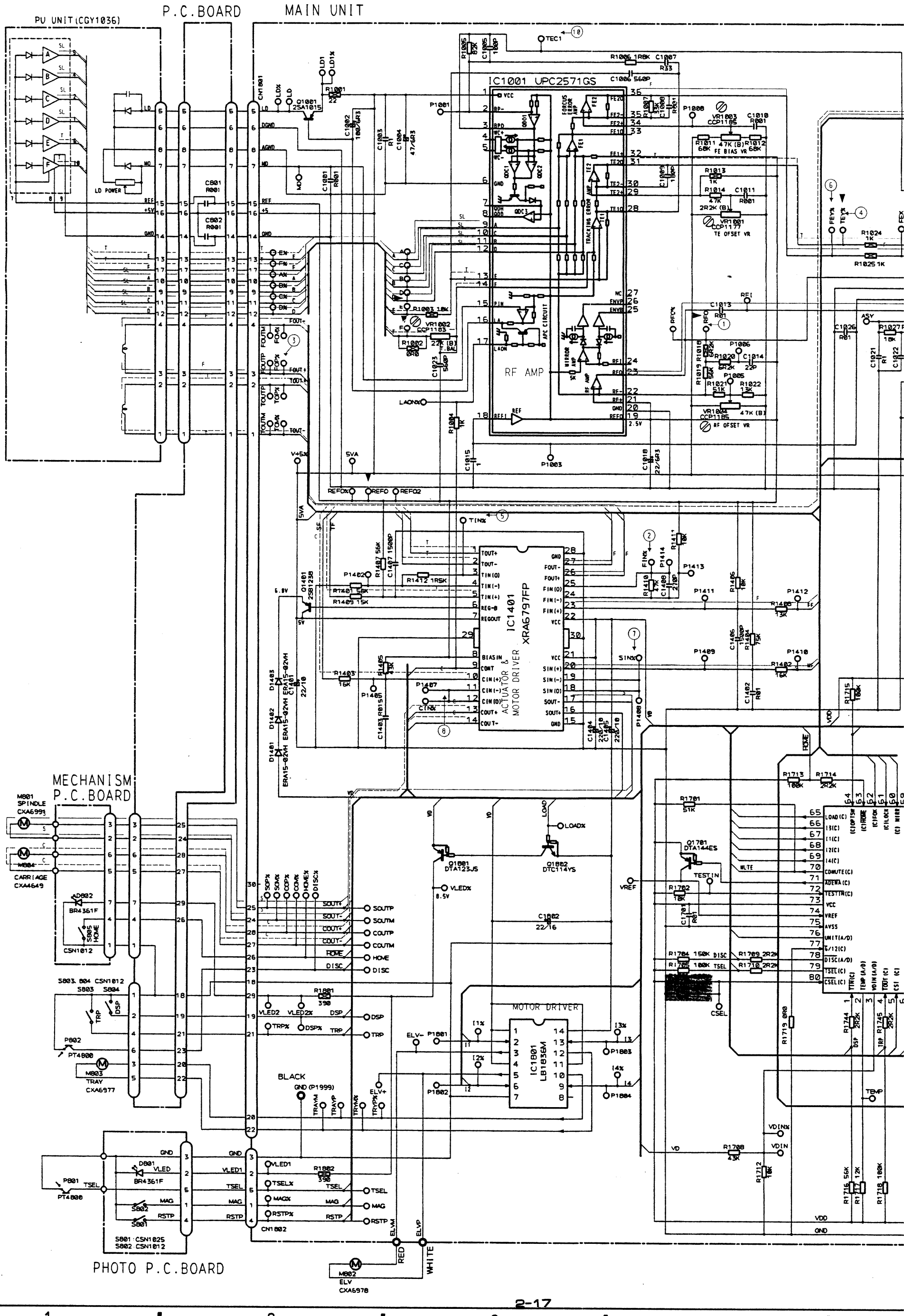



Fig.6

# 4. SCHEMATIC CIRCUIT DIAGRAM(1)

SL —— SIGNAL LINE
F —— FOCUS SERVO LINE
T ---- TRACKING SERVO LINE
C ---- CARRIAGE SERVO LINE
S ..... SPINDLE SERVO LINE



IC1001 UPC2571GS

RF AMP

APC CIRCUIT

DIGITAL SERVO PROCESSOR

IC1201
UPD63700GF

DSP

IC1401
XRA6797FP
ACTUATOR & MOTOR DRIVER

IC1601
SM5874AM
D/A CONVERTER

IC1702
LH5160HN-10L
SRAM

SYSTEM CONTROL

IC1701
PD5293A

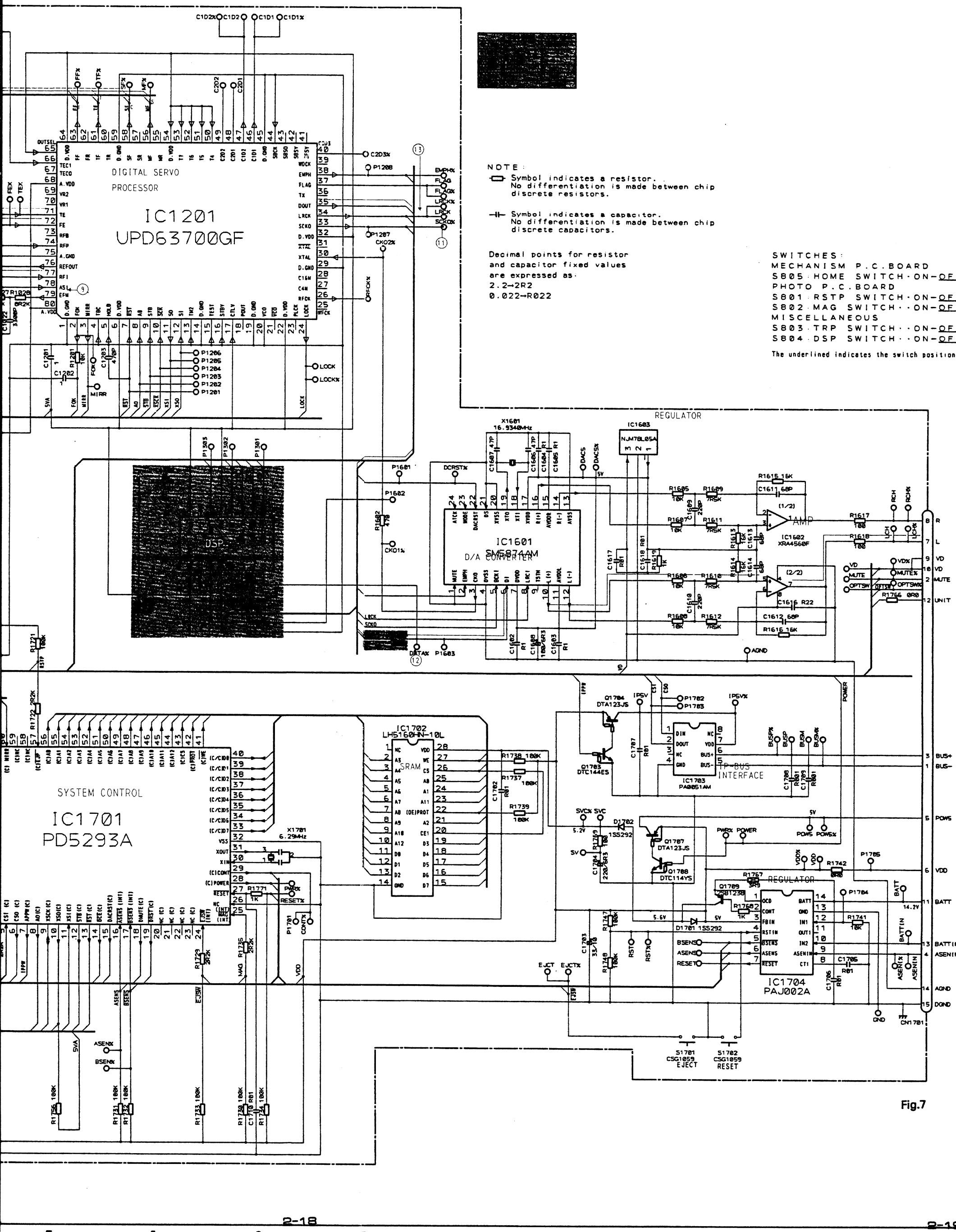
MOTOR DRIVER

IC1801
LB1836M

NOTE :
Symbo
No di
discr

Symbo
No di
discr

Decimal p
and capac
are expre
2.2→2R2
0.022→R0


DIGITAL SERVO PROCESSOR
IC1201
UPD63700GF
DSP
IC1601
SM5874AM
D/A CONVERTER
X1601
16.9340MHz
REGULATOR
IC1603
NJM78L05A
IC1602
XRA4560F
AMP
(1/2)
(2/2)
SYSTEM CONTROL
IC1701
PD5293A
X1701
6.29MHz
SRAM
IC1702
LH5160H-N-10L
IC1703
PA0051AM
TP-BUS INTERFACE
IC1704
PAJ002A
Q1704
DTA123JS
Q1703
DTC144ES
Q1707
DTA123JS
Q1708
DTC114YS
Q1709
2SB1238
D1702
1SS292
D1701
1SS292
S1701
CSG1059
EJECT
S1702
CSG1059
RESET
EXTENSION P.C.BOARD
CN1697
CN1701
P1201
P1202
P1203
P1204
P1205
P1206
P1301
P1302
P1303
P1601
P1602
P1603
P1702
P1703
P1704
P1705
P1206
P1208
P1207
CKO2%
CKO1%
DCRST%
DATA%
LOCK
LOCK%
MIRR
FOK
RFCK%
EMPH%
FLAG%
LRCK%
LRCK
SCKO%
C2D3%
C2D2%
C1D2%
C1D1
C1D1%
DAC5
DAC5%
RCH
RCH%
LCH
LCH%
VD%
MUTE
MUTE%
OPTSW
OPTSW%
AGND
DGND
VDD
BATT
BATTIN
ASENIN
ASEN%
BSEN%
ASENS
BSENS
EJSW
EJECT
EJECT%
RSTO
RSTX
PWRX
RESETX
CONTX
SVA
SVC
SV
5V
5.2V
5.6V
POWER
POWER%
IPSV
IPSV%
BUSP%
BUSP
BUSM
BUSM%
BUS+
BUS-
VD%
R1615 16K
C1611 68P
R1616 16K
C1612 68P
R1617
R1618
R1766 0R0
C1616 R22
R1741
R1742
R1767
R1768
C1705
C1706
C1707
C1708
C1709
C1703
C1704
R1769
D1702
1SS292
R1771 1K
R1738 100K
R1737 100K
R1739 100K
R1747 100K
R1748 100K
R1749 2K2
R1735 2K2
R1722 2K2
R1721 100K
R1731 100K
R1732 100K
R1733 100K
R1734 100K
R1736 100K
R1756 100K
C1710 R01
R1201 10K
C1201 1
C1202 1
C1203 470P
C1022 330P
R1022 0R2K
R1602 470
R1601 10K
R1605 10K
R1609 7R5K
R1607 10K
R1611 7R5K
R1606 10K
R1610 7R5K
R1608 10K
R1612 7R5K
C1609 220P
C1610 220P
C1611 68P
C1613 68P
C1614 68P
R1613 15K
R1614 15K
C1617 R01
C1618 R01
R1619 1K
C1602 R1
C1603 R1
C1604 R1
C1605 R1
C1606 47P
C1607 47P
C1608 100/6R3
R1703 33/10
R1702 R01
R1707 R01
R1708 R01
R1709 R01
R1705 R01
R1706 R01
C1702 R01
C1707 R01
C1708 R01
C1709 R01
C1705 R01
C1706 R01
C1710 R01
R1704 220/6R3
R1769 100
R1768 1K
R1767 3R3
R1742 0R0
R1741 10K
R1705
R1704
R1701
R1702
R1703
R1704
R1705
R1706
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R1708
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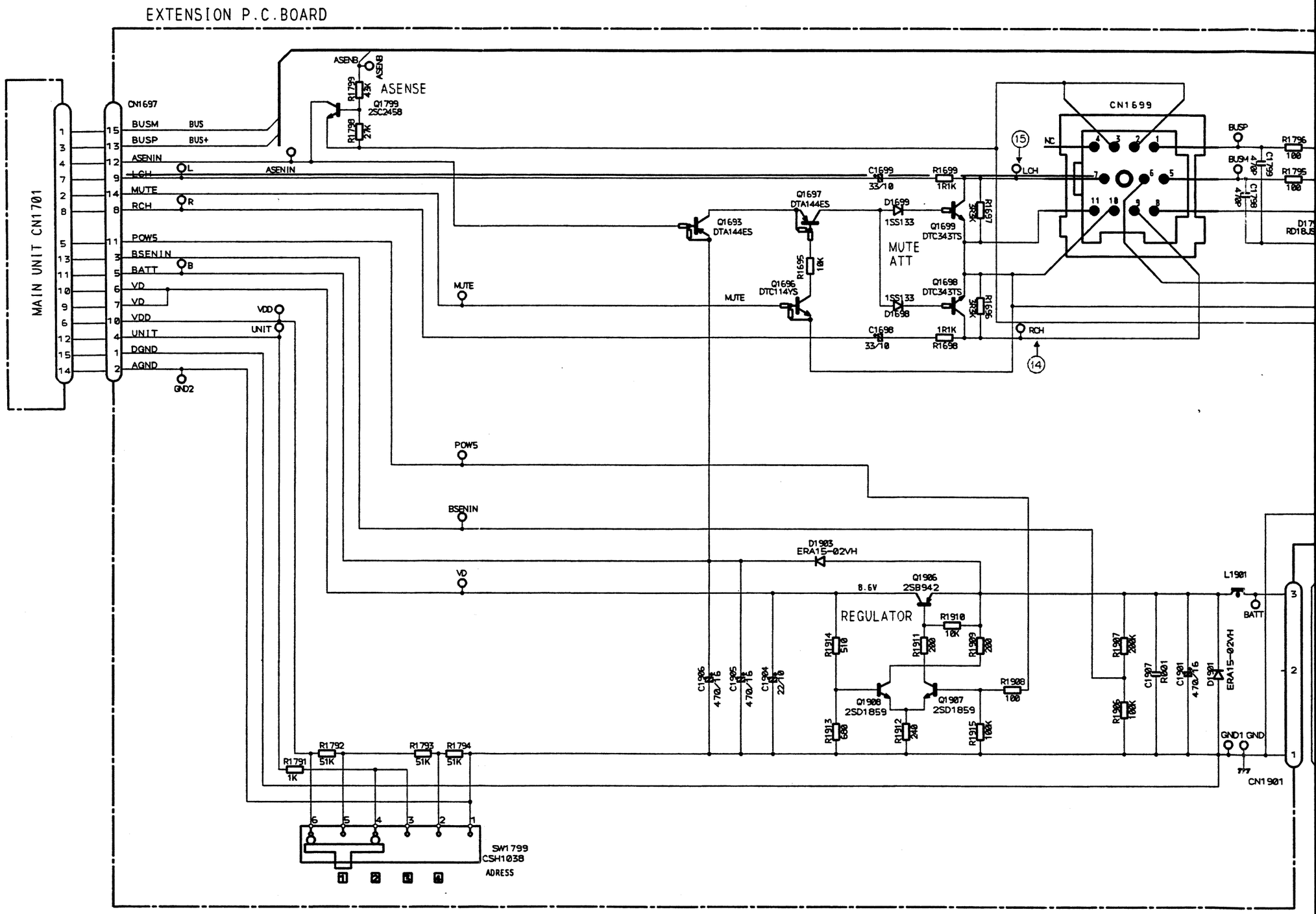
R1732
R1733
R1734
R1735
R1736
R1737
R1738
R1739
R1740

## 5. SCHEMATIC CIRCUIT DIAGRAM(2)



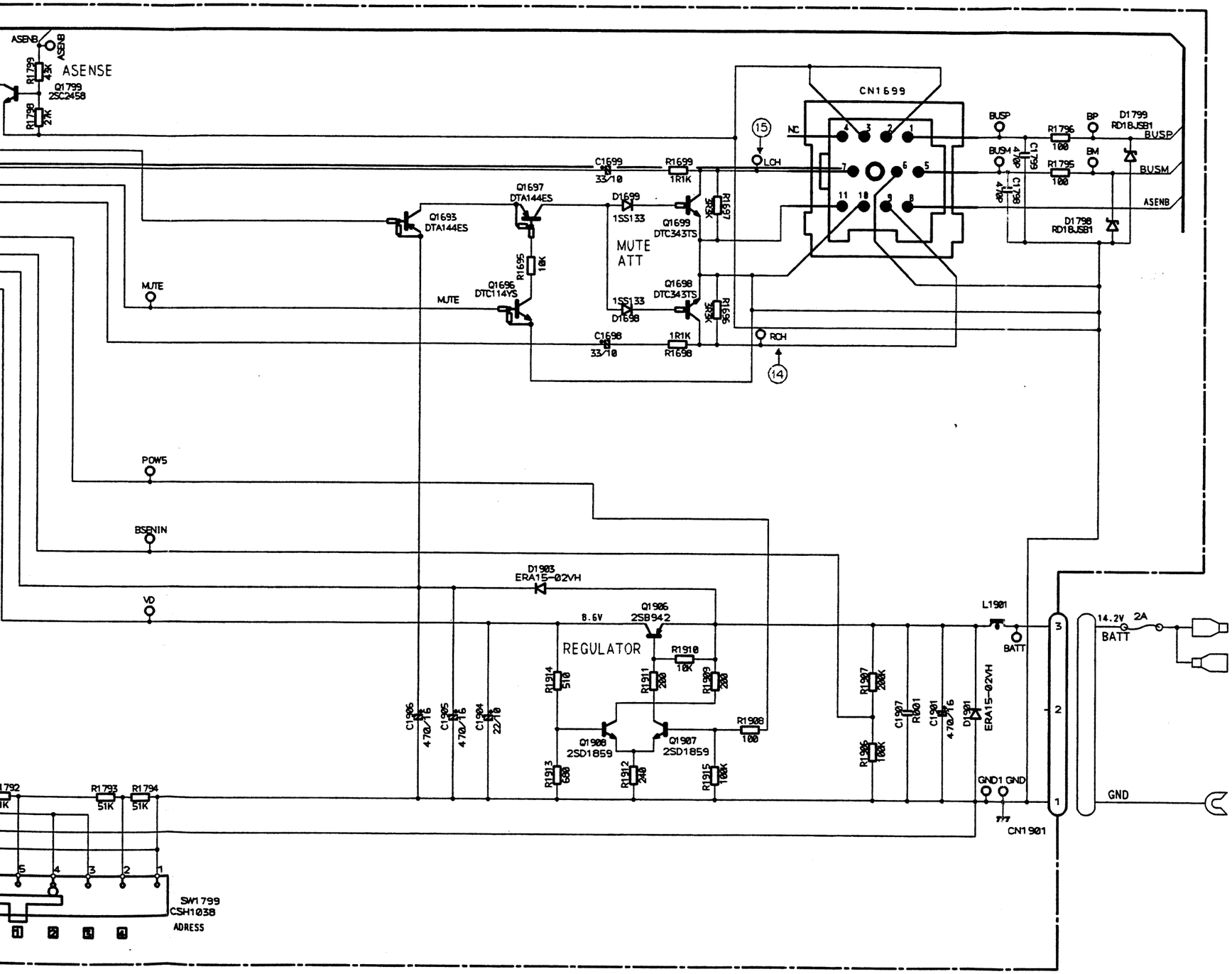
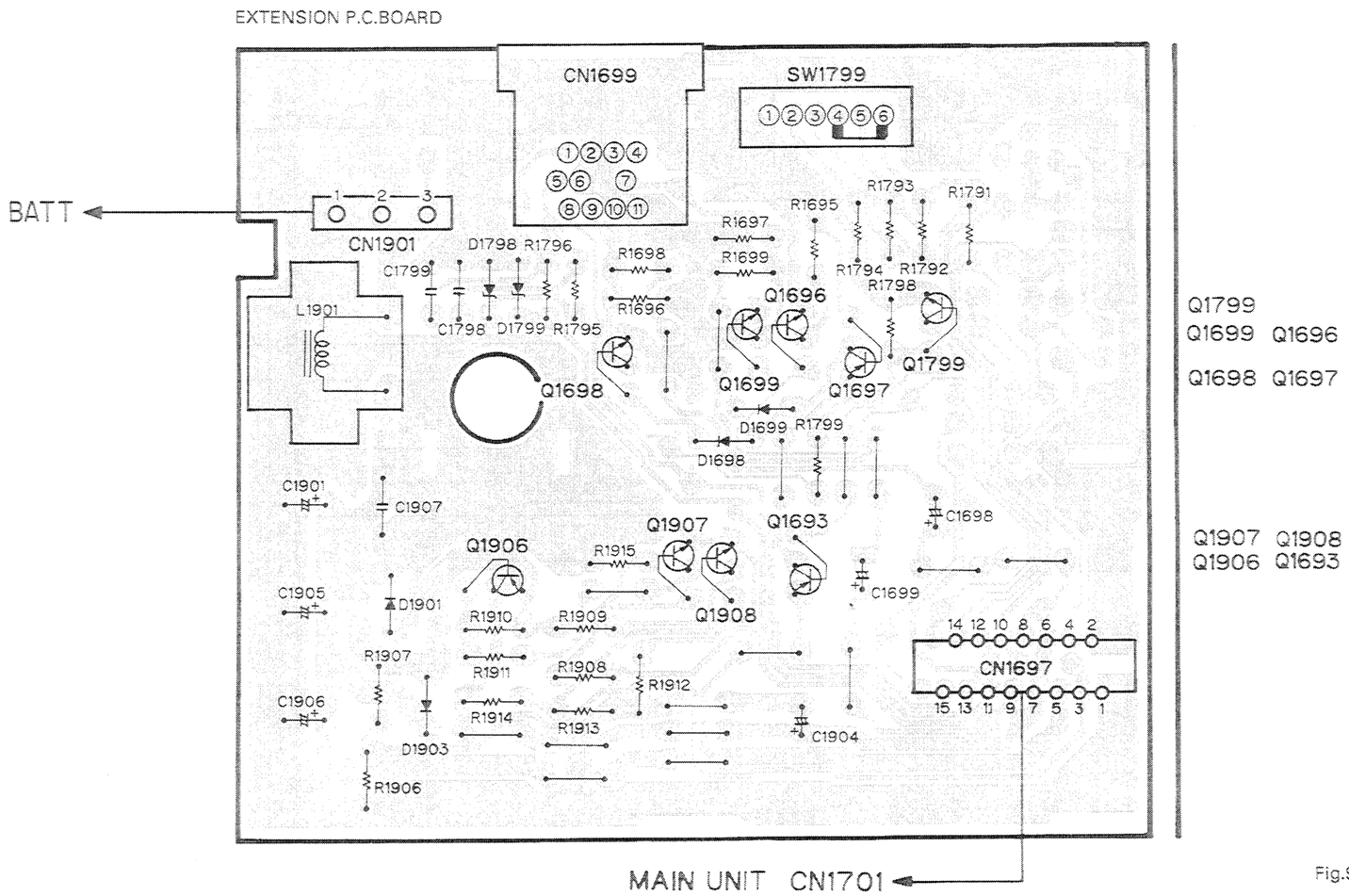

ASENB
ASENB
ASENSE
R1799 47K
Q1799 2SC2458
R1798 27K
CN1699
15
NC
LCH
C1699 33/10
R1699 1R1K
Q1697 DTA144ES
Q1693 DTA144ES
D1699 1SS133
Q1699 DTC343TS
R1697 3R3K
MUTE ATT
R1695 10K
Q1696 DTC114YS
MUTE
MUTE
Q1698 DTC343TS
1SS133 D1698
R1696 3R3K
C1698 33/10
1R1K R1698
RCH
14
BUSP
BP
D1799 RD18JSB1
BUSP
R1796 100
BUSM
BM
C1799 4.7/16
R1795 100
BUSM
C1798 4.7/16
ASENB
D1798 RD18JSB1
POW5
BSENIN
VD
D1903 ERA15-02VH
8.6V
Q1905 2SB942
REGULATOR
R1910 10K
R1914 510
R1911 200
R1909 200
R1907 200K
C1906 470/16
C1905 470/16
C1904 22/16
Q1908 2SD1859
Q1907 2SD1859
R1908 100
C1907 R0001
C1901 470/16
D1901 ERA15-02VH
L1901
BATT
14.2V 2A
BATT
R1913 680
R1912 240
R1915 100K
R1906 100K
GND1 GND
GND
777
CN1901
R1792 1K
R1793 51K
R1794 51K
5 4 3 2 1
SW1799 CSH1038
ADRESS

Fig.8

## 6. CONNECTION DIAGRAM(2)




Q1799
Q1699 Q1696
Q1698 Q1697

Q1907 Q1908
Q1906 Q1693

Fig.9

## 7. BLOCK DIAGRAM

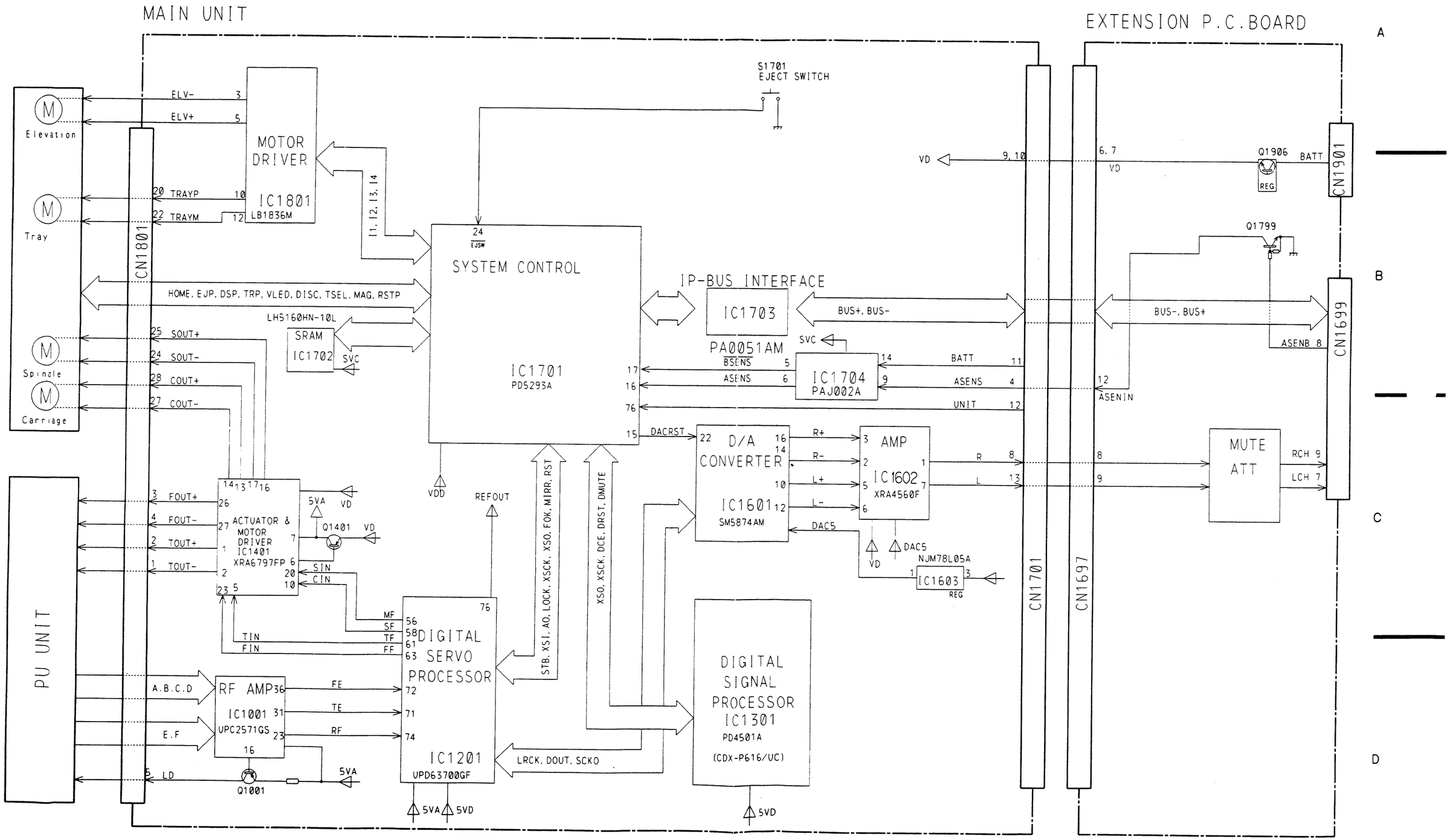



Fig.10

PIONEER
*The Art of Entertainment*

# Service Manual

ORDER NO.
**CRT1631**

**CD MECHANISM UNIT**

# CX-624

COMPACT disc DIGITAL AUDIO

- **This service manual describes operation of the CD mechanism incroporated in models listed in the table below.**
- **When performing repairs use this manual together with the specific manual for model under repair.**

| Model | Service Manual | CD Mechanism Unit |
|---|---|---|
| CDX-P610/UC,EW,ES | CRT1632 | CXK4000 |
| CDX-P616/UC | | |

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1. DISASSEMBLY ..... 2
2. MECHANISM DESCRIPTION ..... 5



**PIONEER ELECTRONIC CORPORATION** 4-1, Meguro 1-Chome, Meguro-ku, Tokyo 153, Japan
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**PIONEER ELECTRONICS OF CANADA, INC.** 300 Allstate Parkway Markham, Ontario L3R OP2 Canada
**PIONEER ELECTRONIC [EUROPE] N.V.** Haven 1087 Keetberglaan 1, 9120 Melsele, Belgium
**PIONEER ELECTRONICS AUSTRALIA PTY.LTD.** 178-184 Boundary Road, Braeside, Victoria 3195, Australia TEL:[03]580-9911


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K-FFS.OCT. 1994 Printed in Japan

# 1. DISASSEMBLY

## ● PU Unit Removal

When removing the connector to the PU unit, attach a short pin from the PU unit to the flexible circuit board.

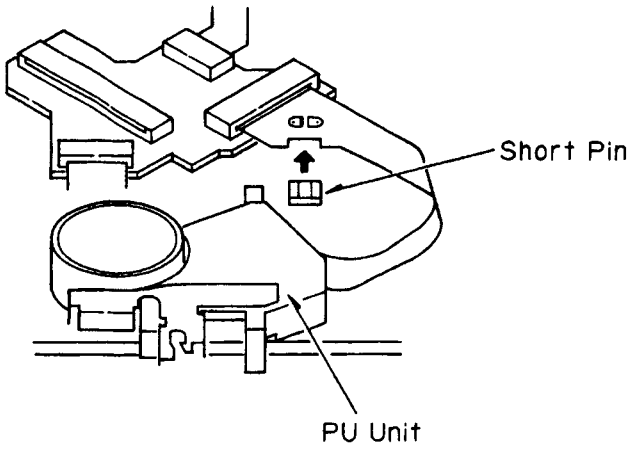



Fig.1

1. Remove the flexible circuit board from the connector.
2. Stretch the spring and hook it on the protrusion.
3. Undo the screw and remove the spring A.

NOTE: When assembling the PU unit, assemble so that section A clamps the shaft.

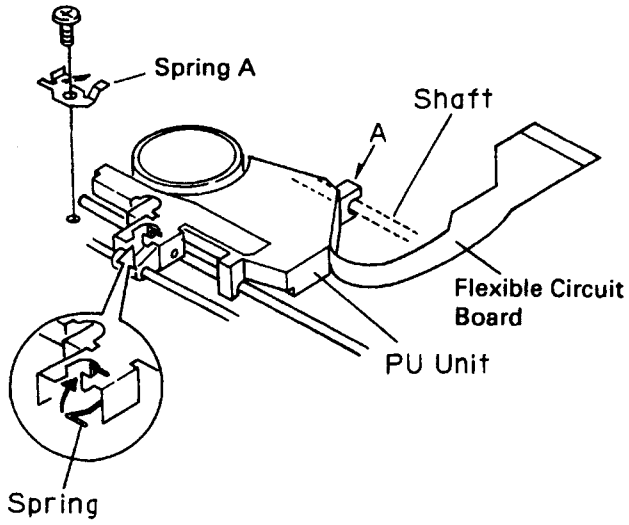



Fig.2

## ● Carriage Motor Assy Removal

1. Remove the screw, spring, belt, screw unit, and then remove the carriage motor assy.

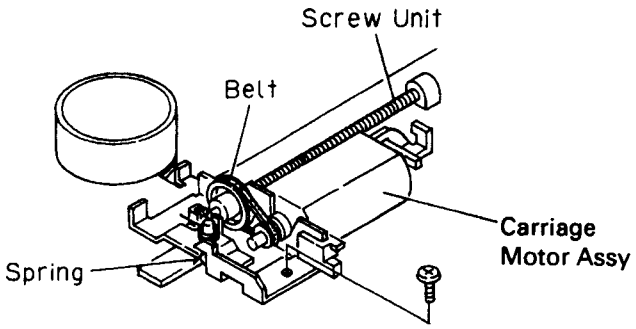



Fig.3

## ● Spindle Motor Removal

1. Undo the seven screws A, and then remove the frame.
2. Undo the four screws B, and then remove the side frame.
3. Run the tray motor to and set the carriage mechanism to play (carriage mechanism lock is released).

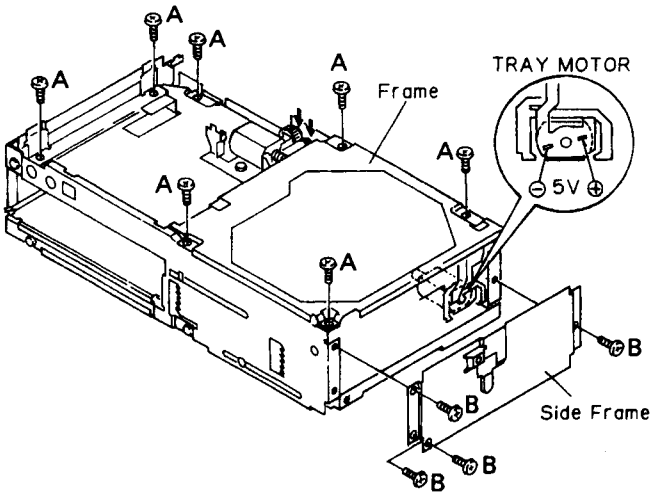



Fig.4

NOTE: When assembling the frame, assemble while placing the gear shaft of the arrow section in the chassis.

4. Turn the mechanism to its rear.
5. Remove the two springs; remove the clamper arm and spacer.

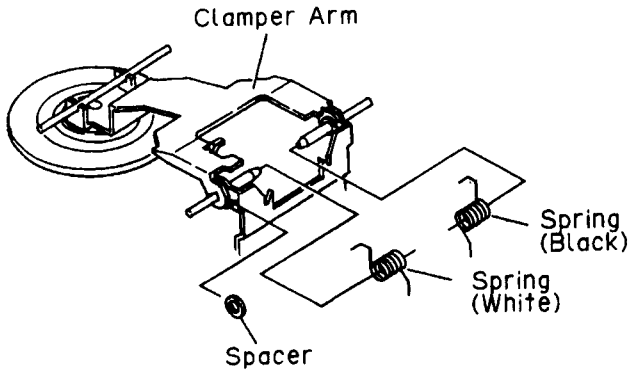



Fig.5

6. Face the mechanism forward.
7. Undo the six screws and remove the carriage mechanism assy.

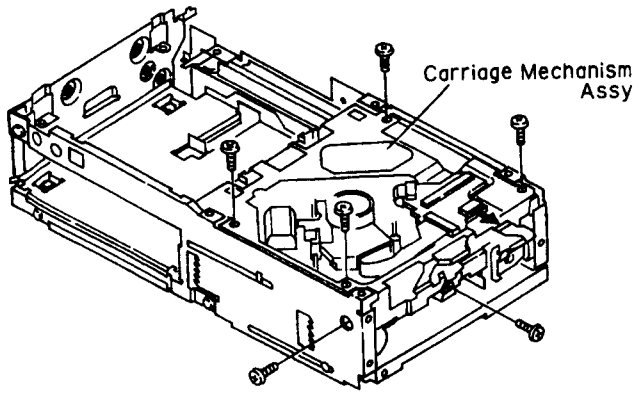



Fig.6

8. Remove the spring and side pressure arm.
   If the side pressure arm is difficult to remove, turn the cam in the direction of the arrow, flip the disc clamper up, and then remove the side pressure arm.
9. Undo the two screws and remove the spindle motor.

NOTE: When assembling the motor, tighten the screws at the position (angle) where the motor's lead wires reach the circuit board.

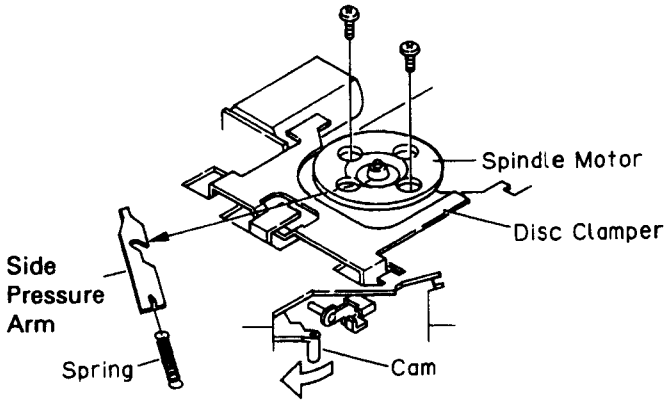



Fig.7

### ● Tray Motor Removal

1. Turn the mechanism to its rear.
2. Undo the one screw and remove the tray motor unit.

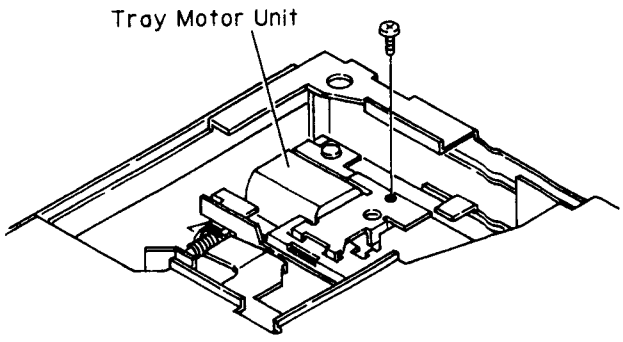



Fig.8

## ● Magazine Holder Removal

1. Turn the tray motor to set the mechanism at the area halfway between play and stop.
2. Undo the four screws and remove the magazine holder.

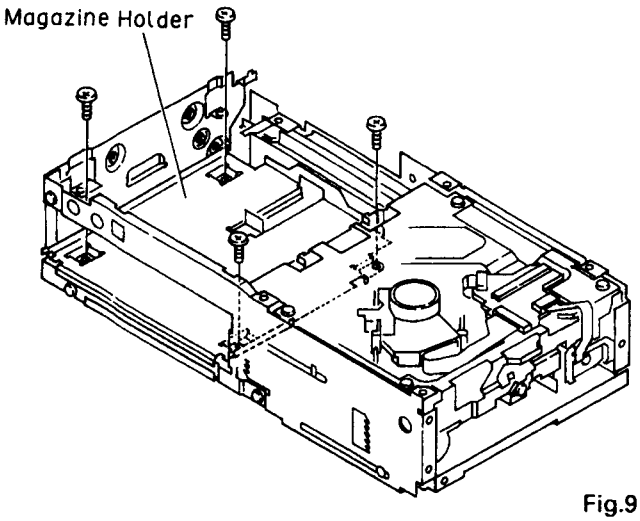



Fig.9

## ● Meshing of Gears When Assembling (fig. shows top view of mechanism)

Cam ring is turned all the way in the counter-clockwise direction.

1. Tray extraction gear section

A) Intermittent gear

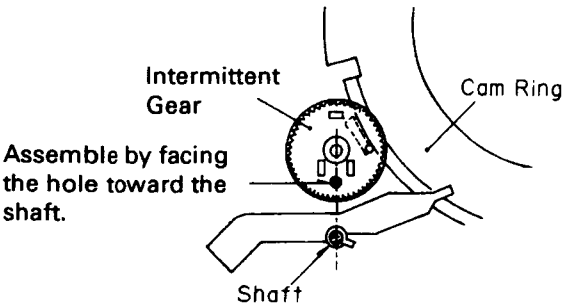



Fig.10

B) Acceleration gear

Assemble by overlapping the holes of the intermittent gear and acceleration gear.

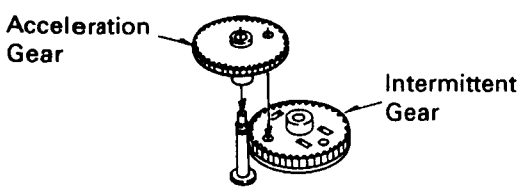



Fig.11

C) Idler gear

Assemble so that the tooth of the acceleration gear with the △ mark meshes with the valley of the idler gear with the △ mark.

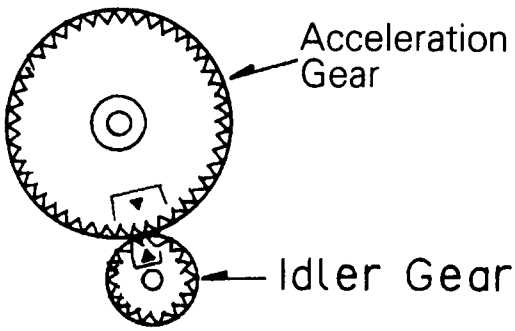



Fig.12

D) Tray gear

Assemble so that the tooth of the idler gear with the ○ mark meshes with the valley of the tray gear with the ○ mark. Also, assemble so that the valley of the tray gear with the △ mark meshes with the last tooth at the end of the tray extraction lever's rack.

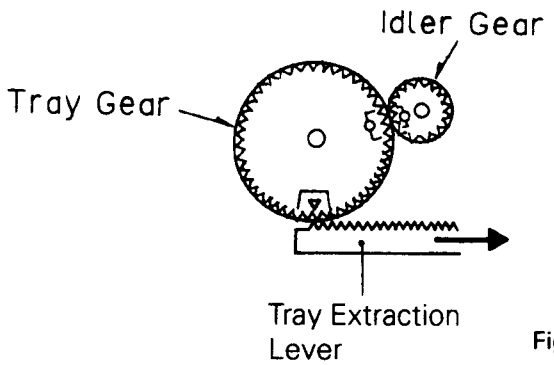



Fig.13

# 2. MECHANISM DESCRIPTION

**● Magazine Insertion**

1. When the magazine is inserted against the force of the eject lever's spring, the eject lever pushes the tip of the magazine SW arm directly before the magazine lock position, causing the arm to swing. This in turn causes the part where the magazine lock arm and magazine SW arm overlap to separate, with the magazine lock arm swinging upward.

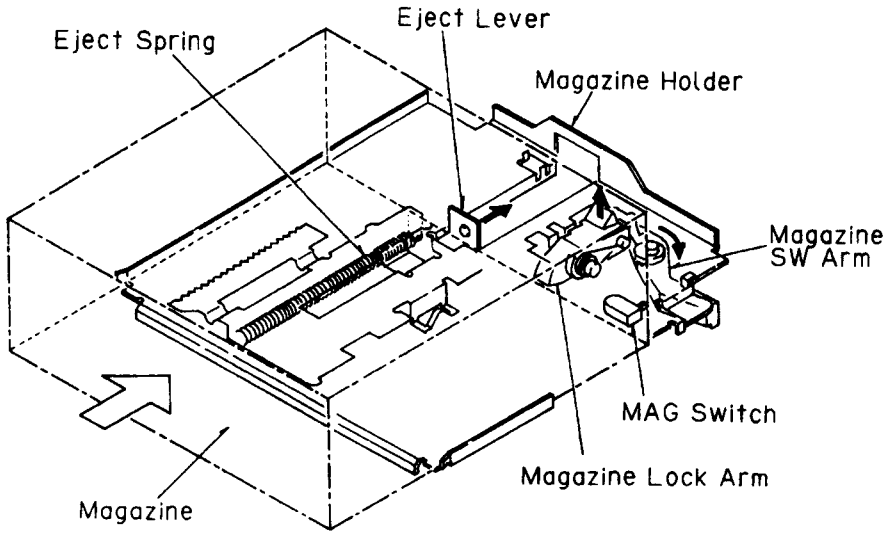



Fig.14

2. If the magazine is inserted up to the lock position, the catch of the lock arm enters the magazine's lock slot, thus locking the magazine. The tapered part of the tip of the magazine lock arm pushes the magazine SW arm, thus tripping the MAG switch.

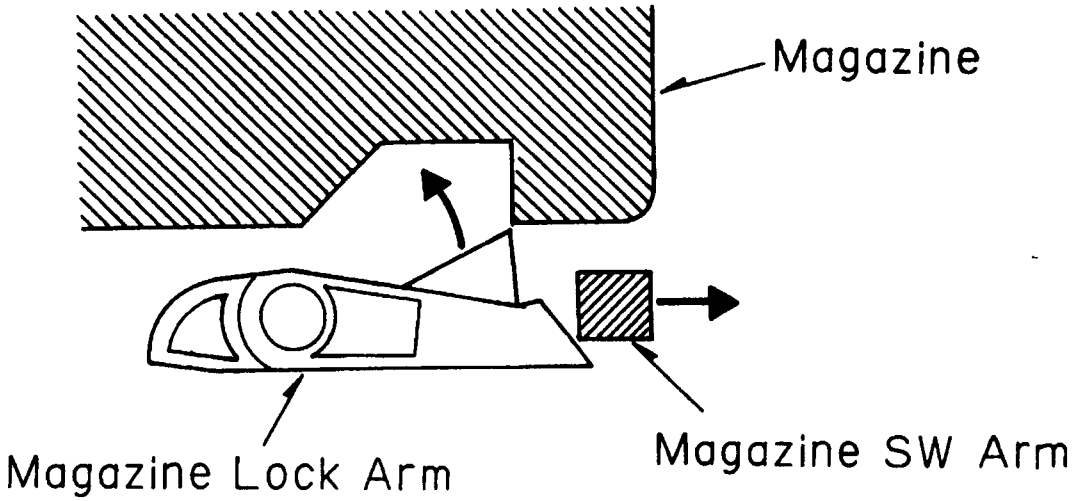



Fig.15

### ● Disc Clamp Operation

1. When the MAG switch is tripped, the tray motor turns and rotates the cam ring. When the cam ring rotates, the tray extraction intermittent gear and tray gear are rotated via the cam ring, causing the tray extraction lever to slide. The tray is then drawn out by the tray extraction lever.

View from below with the stage lower cover removed

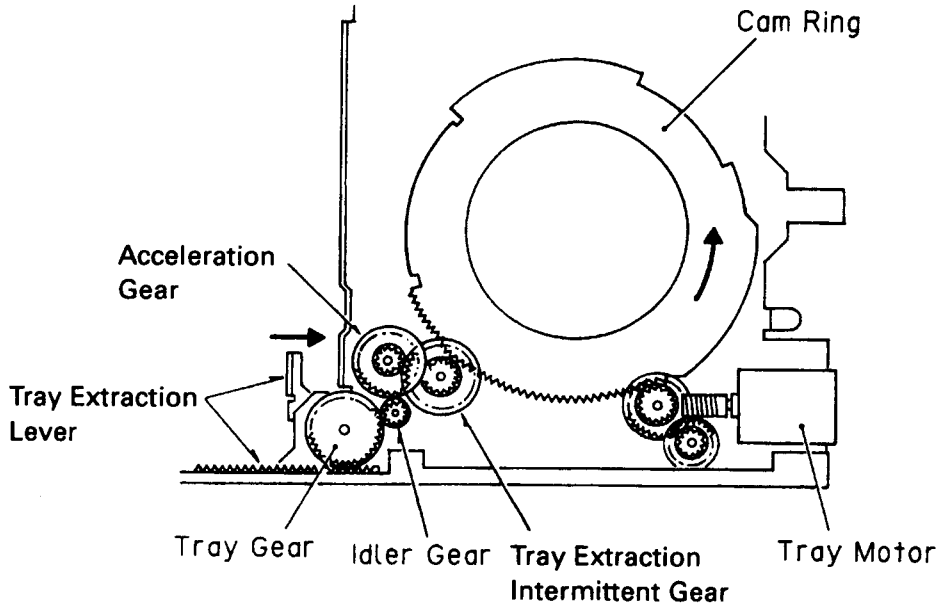



Fig.16

2. After the tray is drawn out, if using an 8 cm disc, the fingers of the disc clamper are released.

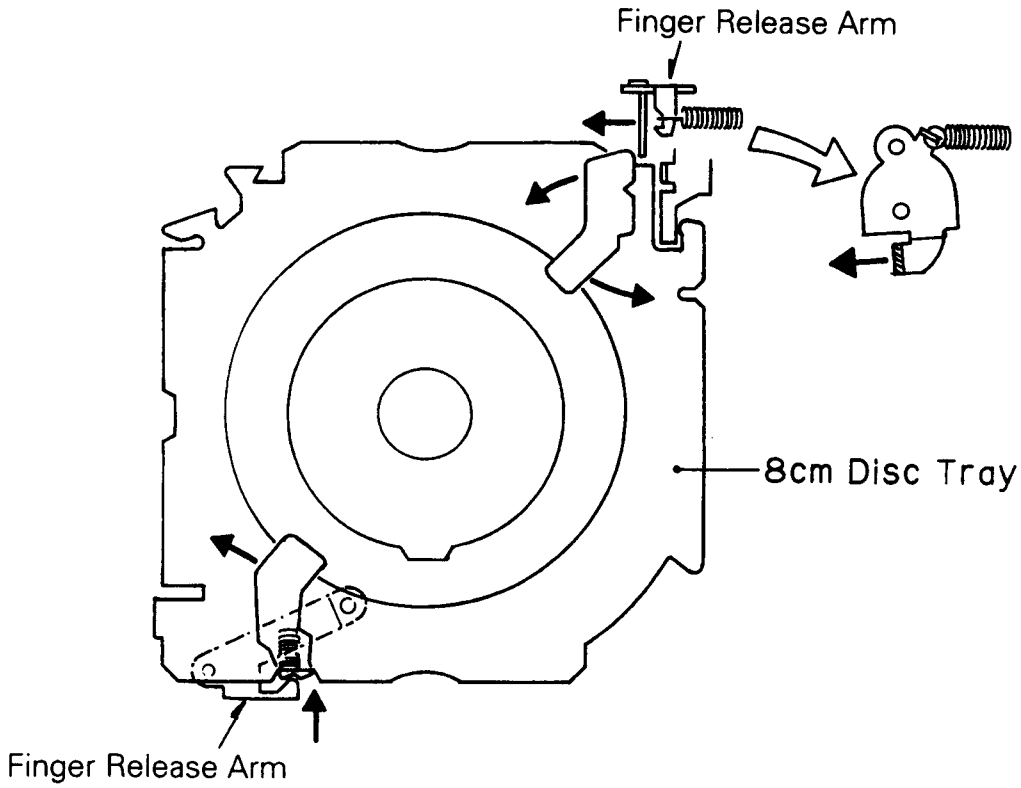



Fig.17

3. When the disc holder fingers have been released, the clamper arm rises and clamps the disc.

3-1. As the lever retaining the shaft at the tip of the clamper arm slides and escapes, the curved part of the cam ring simultaneously retains the shaft, and the spring-activated clamper arm rises.

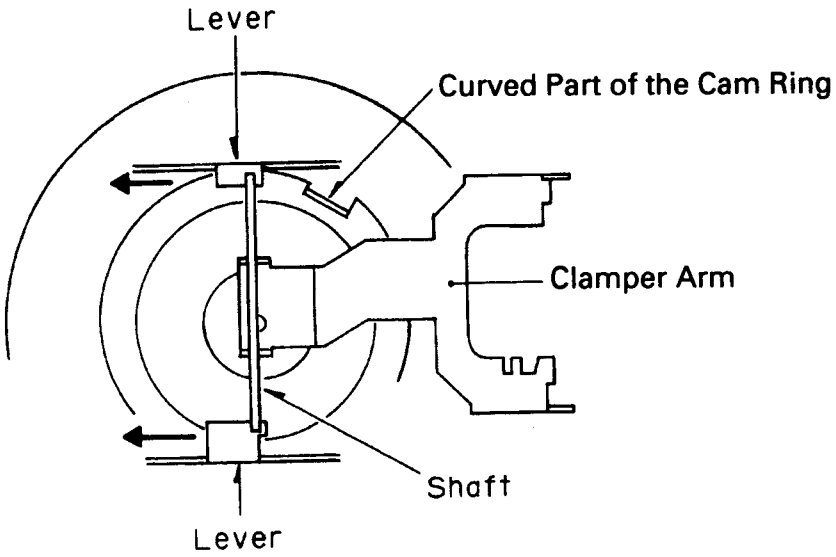



Fig.18

3-2. At the same time the disc clamp performs this action, the clamp and the large and small disc holder arms clamp the disc.

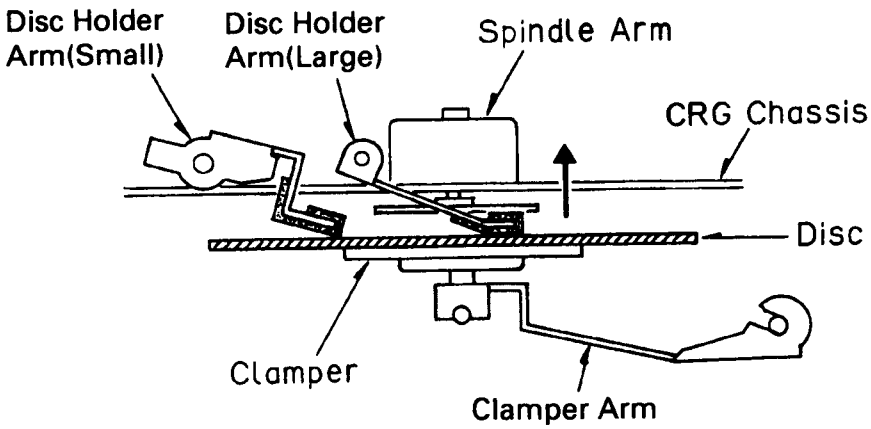



Fig.19

3-3. The large and small disc holder arms are moved up and down by the turning of the disc holder cam. The cam turns while being clamped by the curved part of the CRG lock lever.

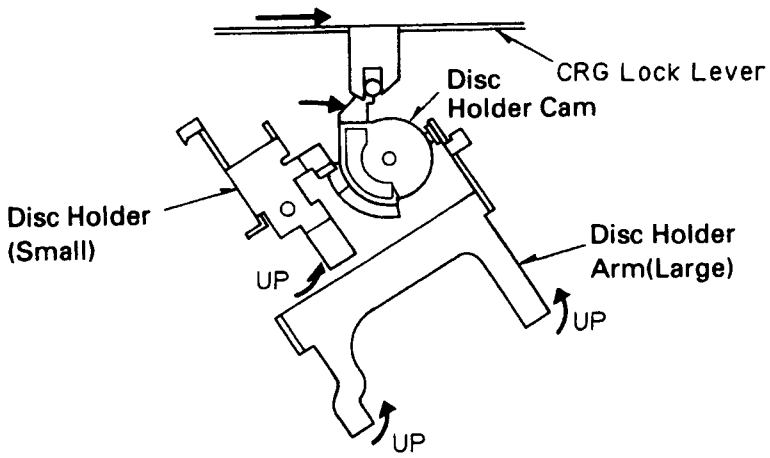



Fig.20

● **CRG Chassis Lock Release**

1. After clamping is complete, the tray motor continues to turn, and begins the procedure to release the CRG chassis locks. The locations of the locks are indicated by ① ② ③ in fig. 21. Locks ① ② ③ are released almost simultaneously.

① The cam ring turns causing the arm to rotate. The contraction of the arm tip and the CRG lock lever's slot are interlinked. When the arm turns, the CRG lock lever slides, thus releasing the CRG chassis's lock (up/down direction).(Fig. 22)

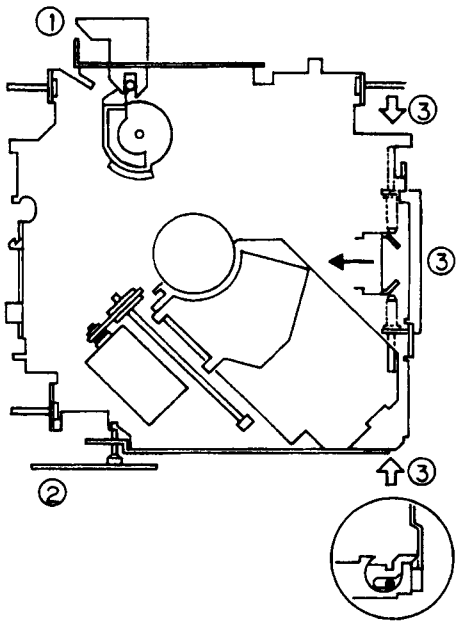



Fig.21

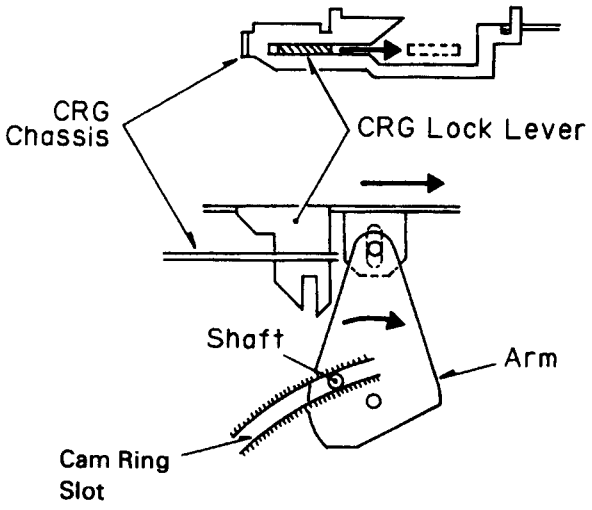



Fig.22

② The cam ring turns causing the link to be pushed, sliding the CRG lock lever, thus releasing the CRG chassis's lock (up/down direction).(Fig. 23)

③ The cam ring turns and the CRG lock lever slides. The tip of the lever inserted between the CRG chassis's shafts such that it is clamped by the shafts separates, thus releasing the CRG chassis's lock (front/rear direction).(Fig. 24)

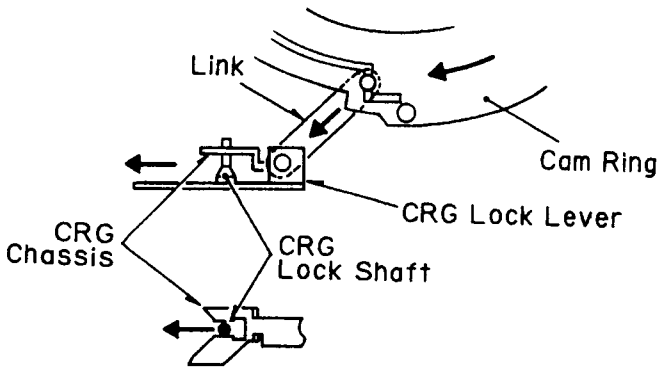



Fig.23

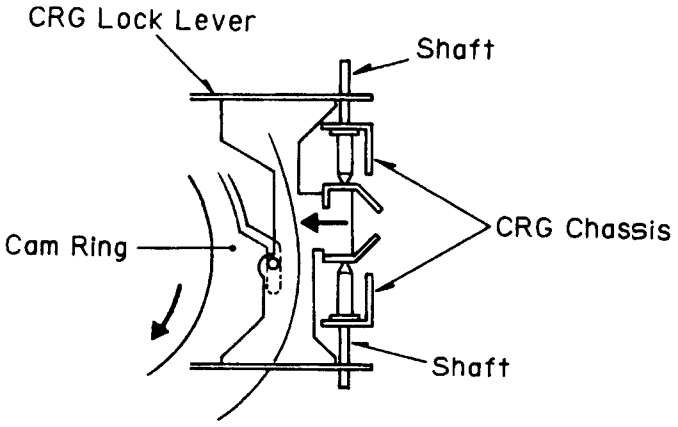



Fig.24

2. Simultaneously with the operation described above, the CRG lock lever slides, the CRG lock arm swings, freeing the clamped shaft and releasing the CRG chassis's up/down and right/left locks.
   The operations described above release the locks of the CRG mechanism leaving it "floating."

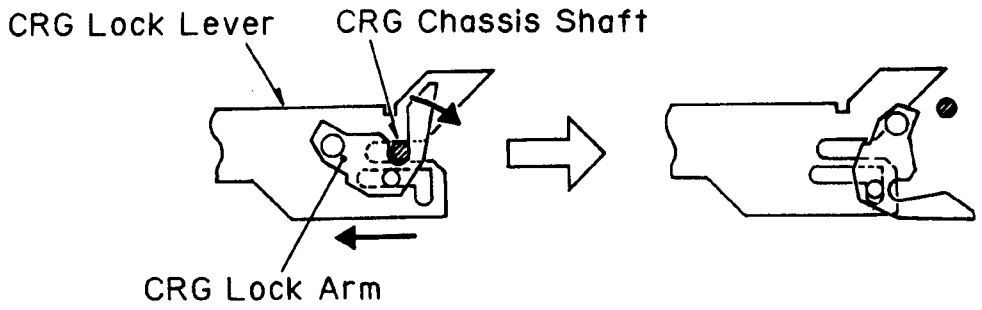



Fig.25

## ● Stage Lock

Looseness in the elevator mechanism is eliminated and vibration resistance is enhanced by locking the three (① ② ③) locations shown in fig. 26.

1. The CRG lock lever slides and pushes the stage lock lever. (Fig. 27)
2. The wedge shape of the lever tip is held in place by the square hole of the frame, and the stage mechanism is actuated in the left/right and up/down directions.(Fig. 27)

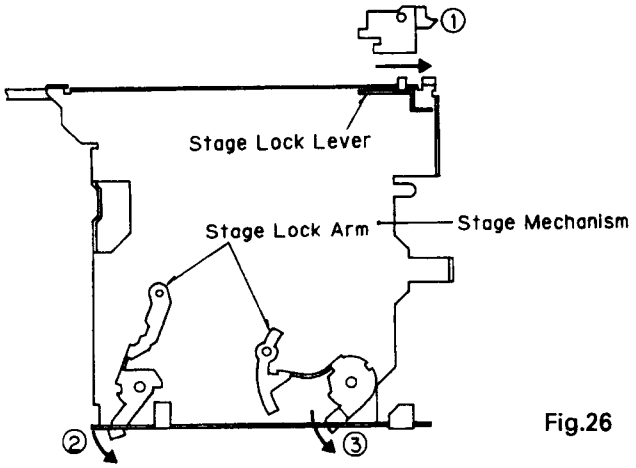



Fig.26

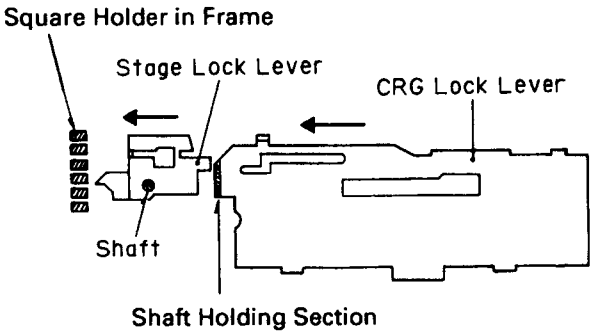



Fig.27

3. The rotation of the cam ring causes the stage lock arm to swing. The tip of the arm is held in place by the tapered part of the frame, and the stage mechanism is actuated in the left/right, up/down and front/rear directions.(Fig. 28,29)

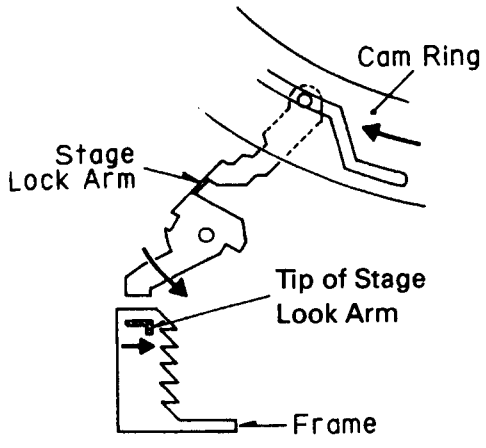



Fig.28

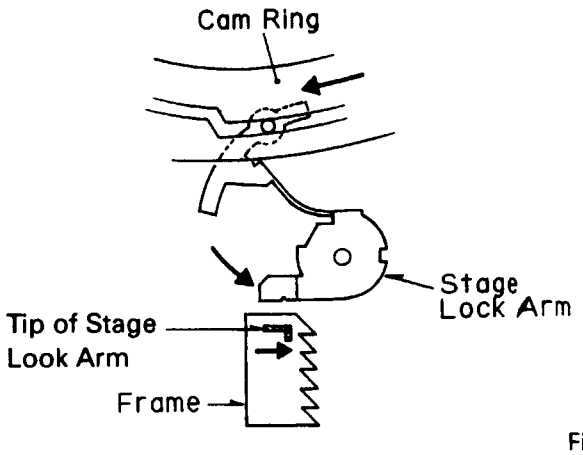


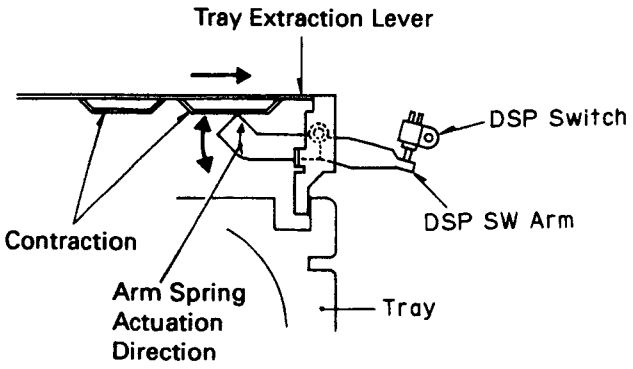

Fig.29

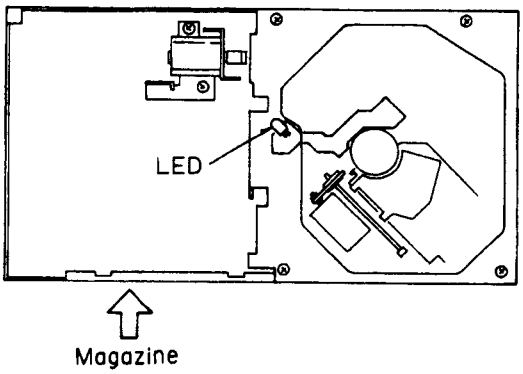
● **From Play to Tray Storage**

This operation is basically carried out in reverse of the operation from disc clamp to stage lock.

● **Disc Detection, Tray extraction/insertion Completion Detection**

The DSP switch is turned on and off by the contracting part of the tray extraction lever for extracting and inserting the tray, and the photosensor detects whether the tray contains a disc or not, and whether the disc is 8 or 12 cm, while being timed.




The photo-transistor is on the stage mechanism side and the LED is on the CRG mechanism side. The tray passes between the two.

Fig.30

● **Tray extraction/insertion Completion Detection**

A) Play side(Fig. 31)

When play is complete, the CRG lock lever slides, pushing the tip of the TRP switch arm and turning the switch on.

B) Tray return side (eject side)(Fig. 32)

When tray return is complete, the tray extraction lever pushes the TRP SW lever, the TRP SW lever pushes the TRP SW arm, turning the TRP switch on.

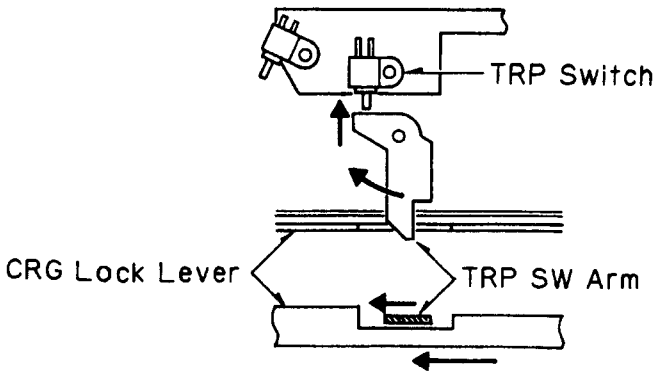



Fig.31

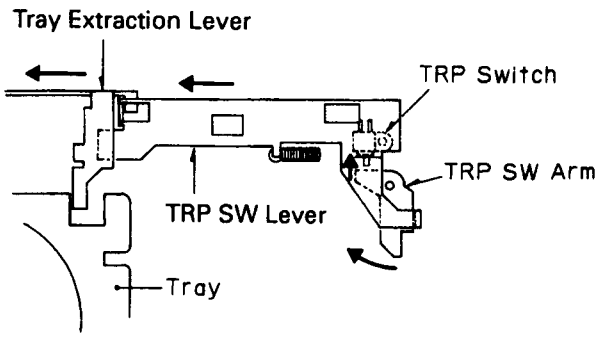



Fig.32

## ● Elevator Operation

1. The inside steer slides when the ELV motor is driven. The front steer interlinked with the inside steer also slides. The shaft protruding from the stage mechanism is interrelated with the three front/rear stage holes, and the stage moves up or down when the steer slides. A gravitational force counter spring is provided on the magazine side arm in order to relieve the difference in load caused by gravitational force for rising and lowering.

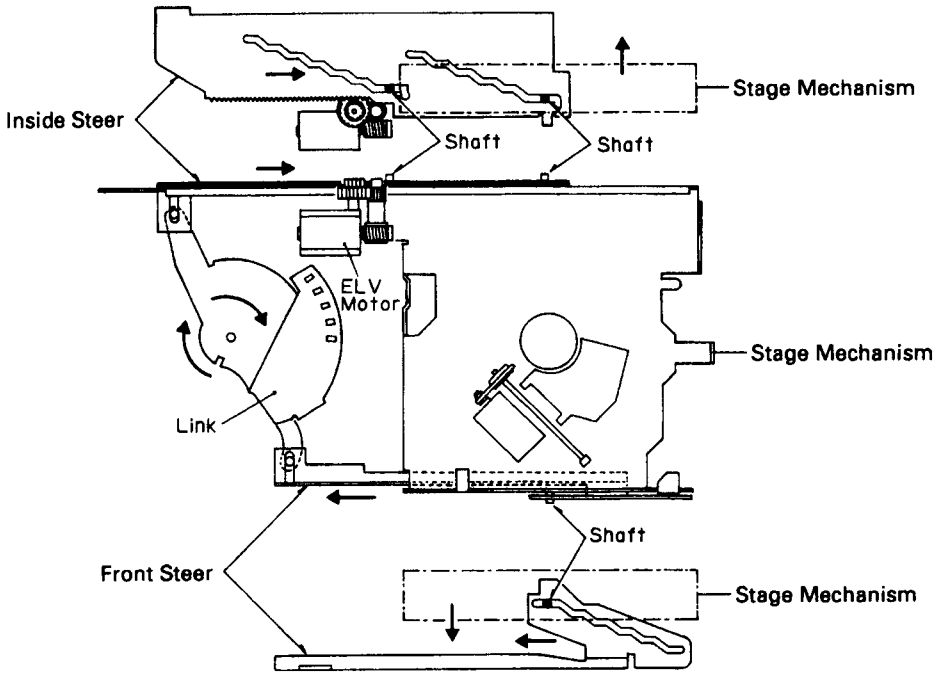



Fig.33

Gravitational force counter spring

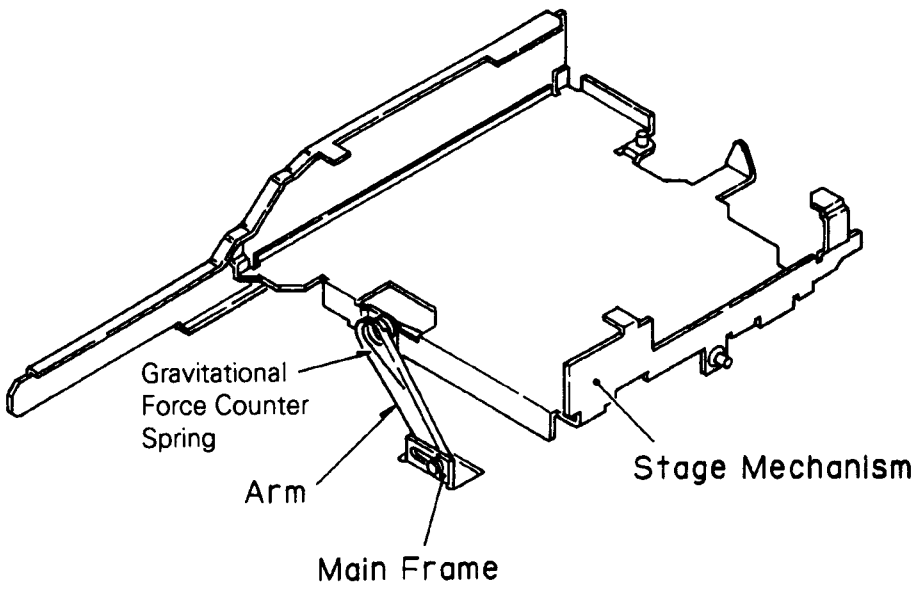



Fig.34

## ● Elevator Detection

1. There is a hole in the link in the position that corresponds to the straight part of the steer's stage holes. This hole is detected by the photo-transistor. (Fig. 35)
2. The highest stage is not detected by photo-transistor, but is rather detected when the RSTP switch is tripped. The magazine eject position is detected by the photo-transistor detecting the position of hole in the link when the steer moves.(Fig. 36)
   The mechanism reset position is the position where the RSTP switch mentioned above is tripped.

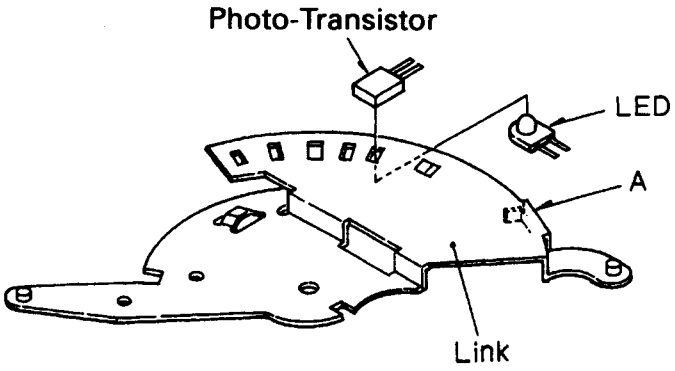



Fig.35

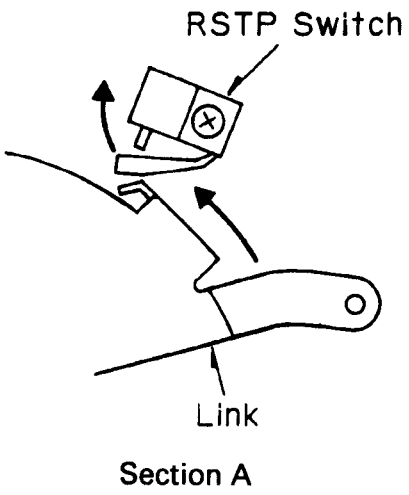



Fig.36

## ● Magazine Discharge

1. If the steer is further driven from the detection position of the elevator's highest stage, the contraction of the link pushes up the tip of the lock arm mentioned in "Magazine insertion." When it does, the lock part which is the tip of the other lock arm drops down below, releasing the magazine's lock. The magazine is discharged by the eject lever.

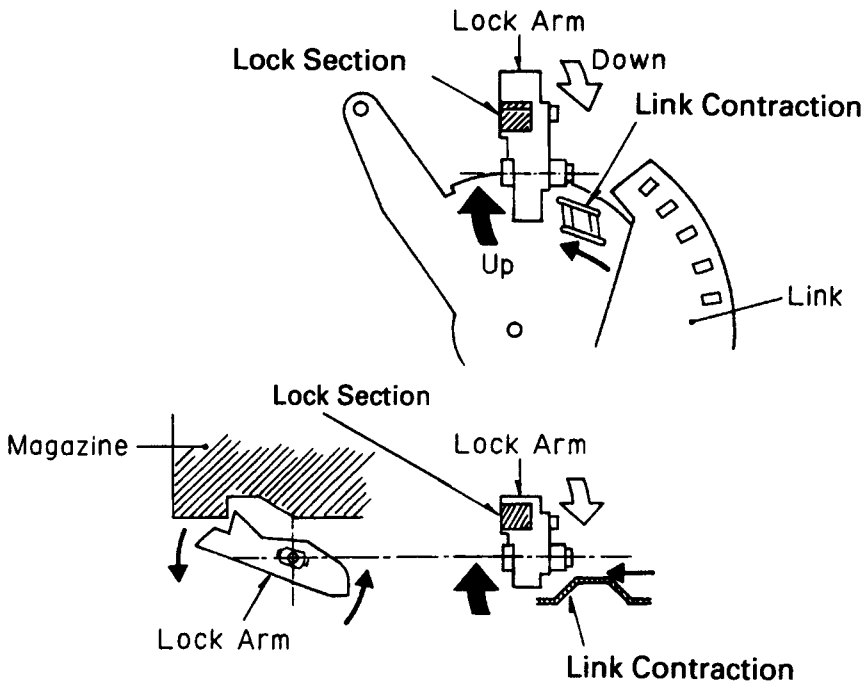



Fig.37

# 2. OPERATIONS AND CONNECTION

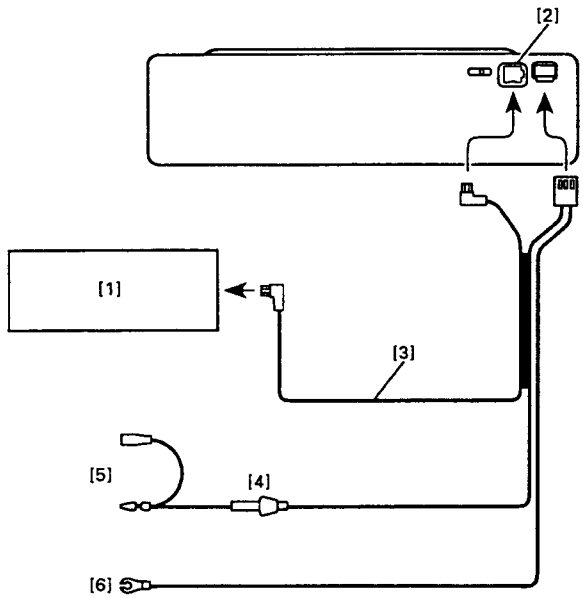



Fig.1

(Fig. 1)

[1] Multi CD controller or Multiple installation adapter (such as CD-P44)

[2] IP-BUS output (black)
Connect the black connector of the cable to this connector.

[3] IP-BUS cable
To prevent incorrect connection, the input side of the IP-BUS connector is colored in blue, and the output side in black. Connect the connectors of the same colors correctly.

[4] Fuse holder

[5] Orange
To the terminal always supplied with power regardless of ignition switch position.

[6] Black (ground)
To the vehicle (metal) body.

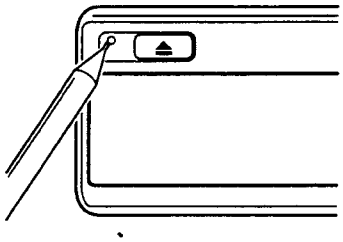


Fig.2

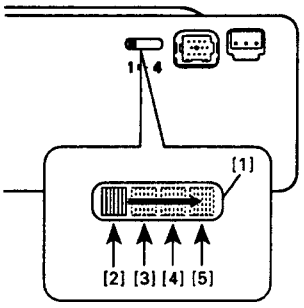



Fig.3

## Pressing the clear button

If the power does not switch on or if the compact disc player does not operate when the button on the multi-CD controller is pressed, or if the multi-CD controller display is incorrect, press this button on the player with the tip of a pencil to restore normal operation. (This button is located inside the door.)Always press the clear button on the multi-CD contoller, too, after pressing this button (Fig. 2).

- If the clear button is pressed when the player contains a magazine or the ignition switch is set to the ON or ACC position, the CD title display and ITS memory are cleared.

## Changing the Address Switch

- This unit can be connected from the second to fourth multi-CD players by using the separately sold multiple installation adapter (CD-P44). Each multi-CD player has an address switch so that the multiple installation adapter can identify which player is which. Set the address switch for each player as shown in Fig. 3.
- See the instruction manual for the multiple installation adapter (CD-P44) when you connect multi-CD players using the adapter.

(Fig. 3)

[1] Address switch
This switch can be set to address 1, 2, 3, or 4, starting from the left.

[2] Address 1

[3] Address 2

[4] Address 3

[5] Address 4

# 3. DISASSEMBLY

**● Removing the Case**

1. Remove the five screws.
2. Remove the upper case and lower case.

**● Removing the Grille Assy**

1. Press the four tabs indicated by arrows and then pull out the grille assy.

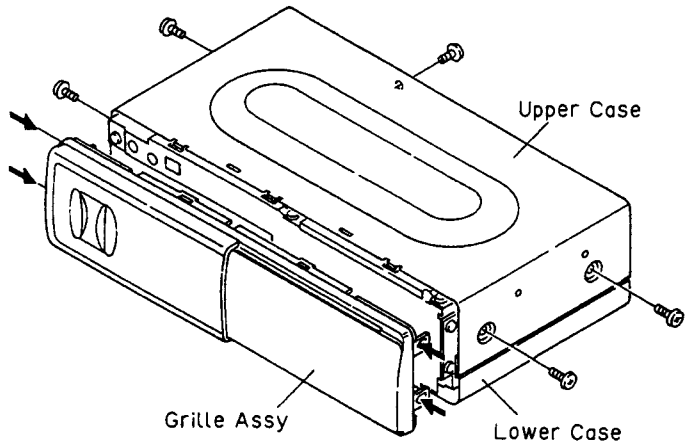



Fig.4

**● Removing the Extension P.C.Board**

1. Remove the one screw.
2. Unbend the tab A until straight.
3. Remove the extension p.c.board.

**● Removing the Main Unit**

1. Remove the one screw.
2. Unbend the tab B until straight.
3. Remove the main unit.

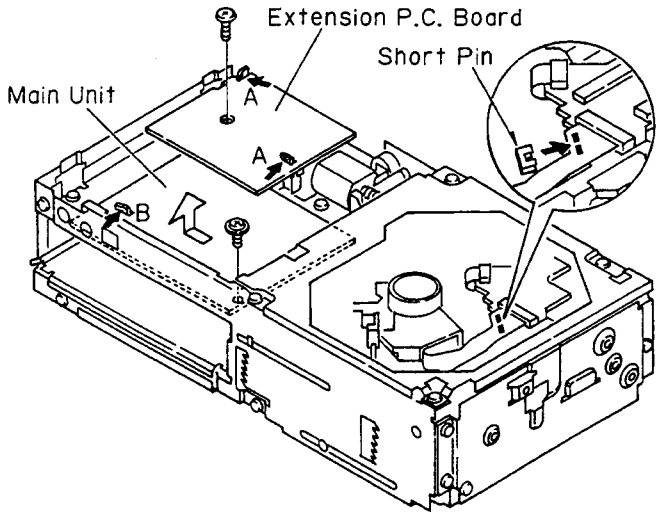



Fig.5

Before disconnecting the connector(PU unit connector), attach a short pin as illustrated.

# 4. ADJUSTMENT

## 4.1 CD ADJUSTMENT

1)Precautions

- This unit uses a single power supply (+5V) for the regulator. The signal reference potential, therefore, is connected to REFO(approx. 2.5V) instead of GND.
  If REFO and GND are connected to each other by mistake during adjustments,not only will it be impossible to measure the potential correctly,but the servo will malfunction and a severe shock will be applied to the pick-up. To avoid this,take special note of the following.
  Do not connect the negative probe of the measuring equipment to REFO and GND together. It is especially important not to connect the channel 1 negative probe of the oscilloscope to REFO with the channel 2 negative probe connected to GND.
  Since the frame of the measuring instrument is usually at the same potential as the negative probe,change the frame of the measuring instrument to floating status.
  If by accident REFO comes in contact with GND,immediately switch the regulator or power OFF.

- Always make sure the regulator is OFF when connecting and disconnecting the various filters and wiring required for measurements.

- Before proceeding to further adjustments and measurements after switching regulator ON,let the player run for about one minute to allow the circuits to stabilize.

- Since the protective systems in the unit's software are rendered inoperative in test mode,be very careful to avoid mechanical and /or electrical shocks to the system when making adjustment.

- This unit is adjusted in a combination with the CD control unit (KEH-P7000, etc.). Each regulator key should be operated at the unit.
  With the KEH-P7000 taken up for reference, a description will be given below concerning how to enter into the test mode, including key operations. The key in the adjustment text is also one of the KEH-P7000 keys.

- How to enter into the test mode
  Switch ACC,back-up ON while pressing the 4 and 6 keys together.

- Resetting the test mode
  Switch ACC,back-up Off.

- Disc detection during loading and eject operations is performed by means of a photo transistor in this unit.Consequently,if the inside of the unit is exposed to a strong light source when the outer casing is removed for repairs or adjustment,the following malfunctions may occur.
  *During PLAY, even if the eject button is pressed,the disc will not be ejected and the unit will remain in the PLAY mode.
  *The unit will not load a disc.
  When the unit malfunctions this way,either re-position the light source,move the unit or cover the photo transistor.

- When loading and unloading discs during adjustment procedures,always wait for the disc to be properly clamped or ejected before pressing another key. Otherwise, there is a risk of the actuator being destroyed.

- Turn power off when pressing the button **FF** or the button **REV** key for focus search in the test mode. (Or else lens may stick and the actuator may be damaged.)

- SINGLE/4TRK/10TRK/32TRK will continue to operate even after the key is released.Tracking is closed the moment C-MOVE is released.

- JUMP MODE resets to SINGLE as soon as power is switched off.

## ● Flow Chart

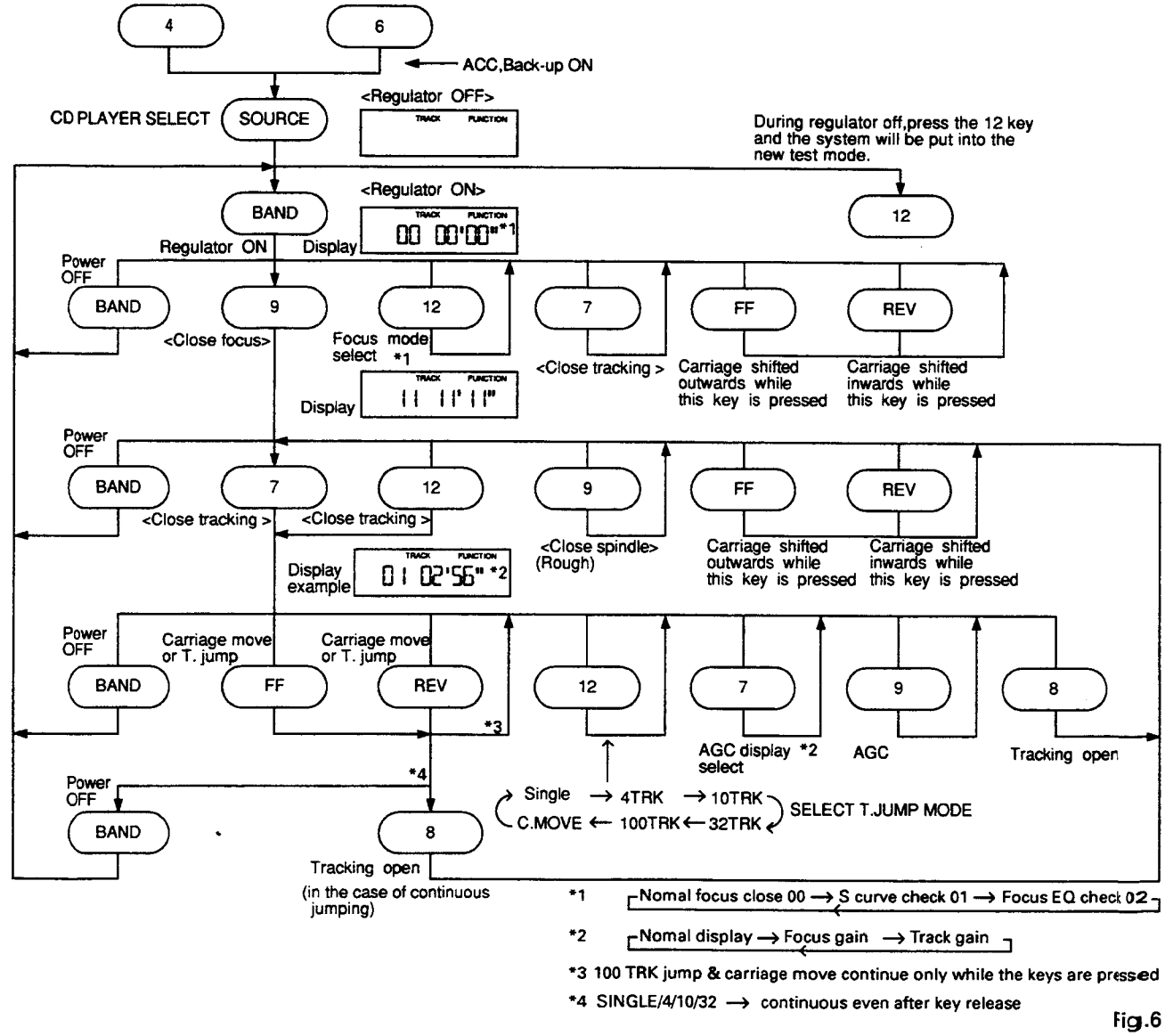
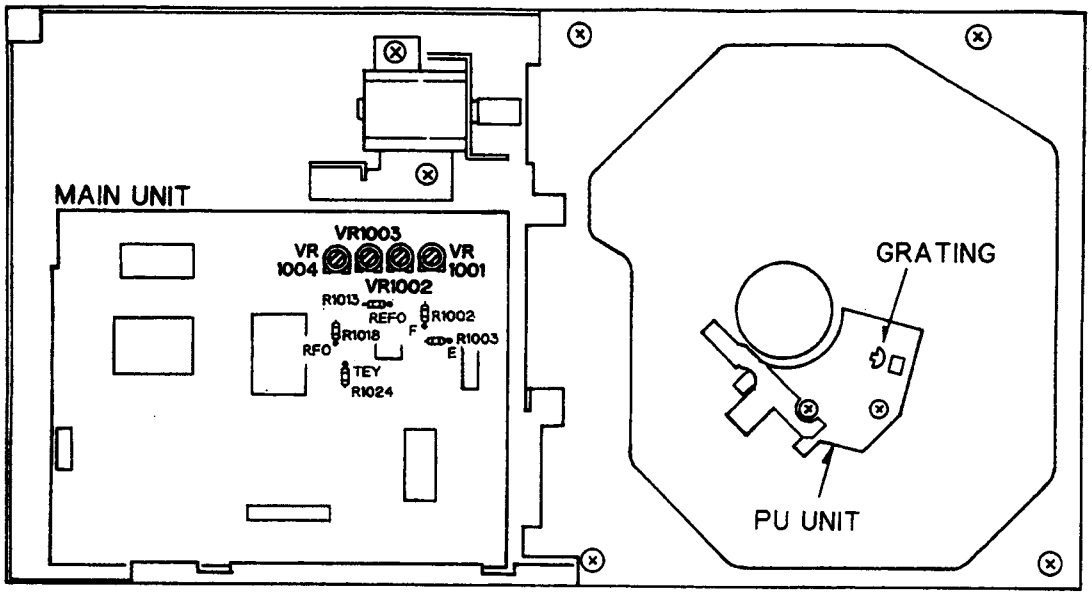



Fig.6

## ● Measuring Equipment and Jigs

| Adjustment | Measuring equipment & jigs |
|---|---|
| 1 Tracking Error Offset Adjustment 1 | DC V Meter |
| 2 Grating Check / Adjustment 1 | Oscilloscope, ABEX TCD-784 (or SONY TYPE 4), Two L.P.F., Clock Driver |
| 3 Grating Adjustment 2 | Oscilloscope, Grating Adjustment Filter (B.P.F.),mV Meter, ABEX TCD-784 (or SONY TYPE 4), Two L.P.F., Clock Driver |
| 4 Tracking Balance Adjustment 1 | Oscilloscope, Low-pass Filter, ABEX TCD-784 (or SONY TYPE 4) |
| 5 Focus Bias Adjustment | Oscilloscope, ABEX TCD-784 (or SONY TYPE 4) |
| 6 RFO Offset Adjustment | Oscilloscope, ABEX TCD-784 (or SONY TYPE 4) |
| 7 Tracking Error Offset Adjustment 2 | DC V Meter |
| 8 Tracking Balance Adjustment 2 | Oscilloscope, Low-pass Filter, ABEX TCD-784 (or SONY TYPE 4) |

## ● Adjustment Point and Test Point



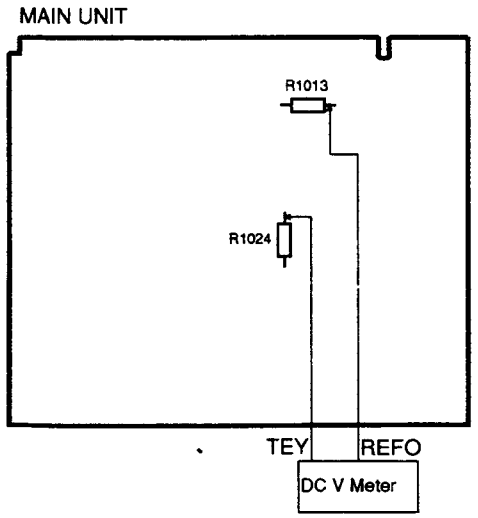

| | |
|---|---|
| VR1001 | TRACKING ERROR OFFSET |
| VR1002 | TRACKING BALANCE |
| VR1003 | FOCUS ERROR BIAS |
| VR1004 | RFO OFFSET |

Fig.7

## 1 Tracking Error Offset Adjustment 1

·**Purpose :**
To adjust the offset of the tracking pre-amp to zero.
·**Symptoms of Mal-adjustment :**
Track search NG, Carriage runaway, Poor playability.

| | |
|---|---|
| ·**Measuring Equipment / Jig** | ·DC V Meter |
| ·**Measuring Point** | ·TEY |
| ·**Test Disc , Mode** | ·No disc, TEST MODE |
| ·**Adjustment Point** | ·VR1001(TE OFFSET VR) |

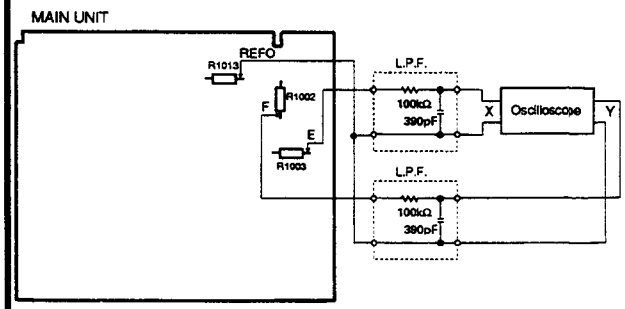



**Adjustment Procedure**
1.Switch the regulator on.
2.Using VR1001, adjust TEY to 0 ± 25mV w.r.t. REFO.

## 2 Grating Check / Adjustment 1

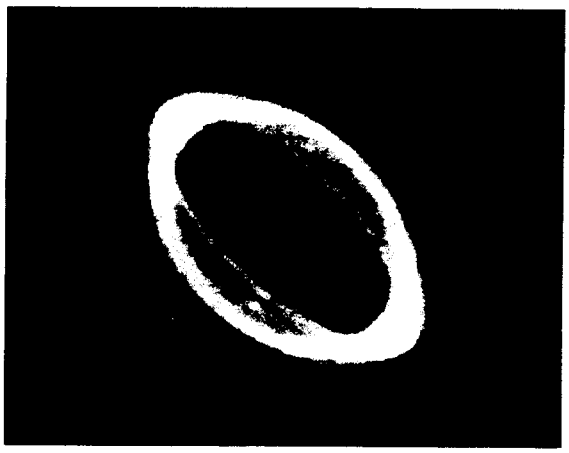
·**Purpose :**
To check that the PU grating is correctly aligned after the PU unit has been replaced.
·**Symptoms of Mal-adjustment :**
Unable to play disc, track skip during search, search NG.

| | |
|---|---|
| ·**Measuring Equipment / Jig** | ·Oscilloscope, Two L.P.F., Clock Driver |
| ·**Measuring Point** | ·E, F |
| ·**Test Disc , Mode** | ·ABEX TCD-784 (or SONY TYPE 4), TEST MODE |
| ·**Adjustment Point** | ·Grating hole |



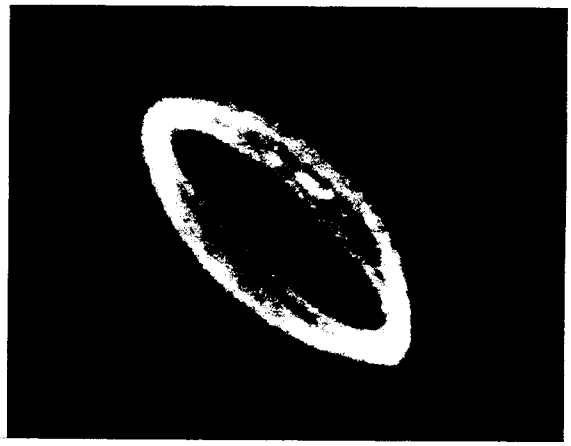

**Adjustment Procedure**
1.Load disc and switch regulator on.
2.Position the PU in the center of the disc using the **FF & REV** keys.
3.Press key **9** to close focus and once more to close spindle.
4.Refering to the photographs given check that the grating is within ±45°. If not, it should be possible to make a fine adjustment to the grating by slowly tuning the grating screw. If, however during the adjustment the lissajous figure is seen to "FLIP" then the null point must be found and the adjustment made from there(see next section).

Lissajous figure (AC input)
Horizontal axis E 10mV/div.
Vertical axis F 10mV/div.



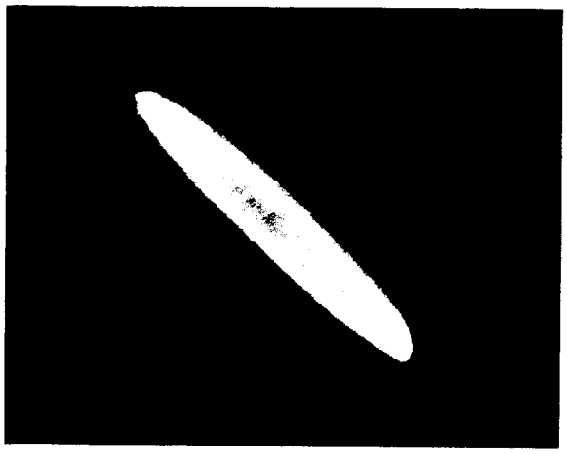
60°=NG

Waveform 1



45°=OK
(Limit)

Waveform 2



0°=BEST
(Doesn't become
a single line due
to eccentricity)

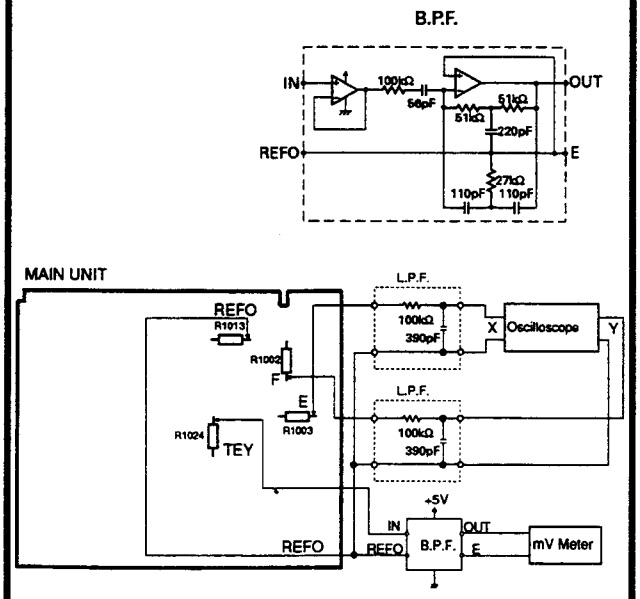
Waveform 3

## 3 Grating Adjustment 2

**·Purpose :**
This needs to be done if the previous adjustment was unsuccessful.

**·Symptoms of Mal-adjustment :**
Unable to play disc, track skipping, track search NG.

| | |
|---|---|
| **·Measuring Equipment / Jig** | ·Oscilloscope, Grating Adjustment filter (B.P.F.), mV Meter, Two L.P.F., Clock Driver |
| **·Measuring Point** | ·TEY, E, F |
| **·Test Disc , Mode** | ·ABEX TCD-784 (or SONY TYPE 4), TEST MODE |
| **·Adjustment Point** | ·Grating hole |

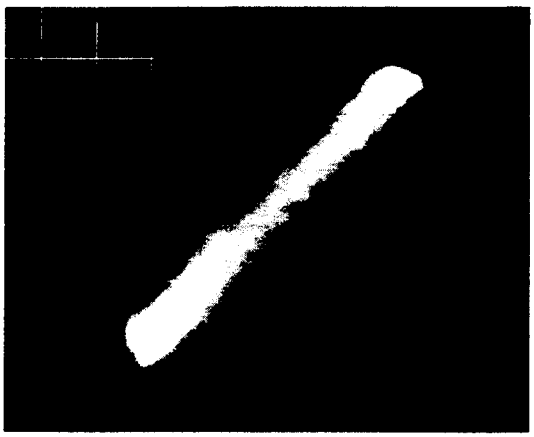



**Adjustment Procedure**

1. Load disc and switch regulator on.
2. Position the PU unit in the center of the disc using the **FF & REV** keys.
3. Press key **9** to close focus and press once more to close spindle.
4. While monitoring the output of the B.P.F. connected to TEY, slowly turn the grating screw. The output voltage should pass through many minimums; search for the minimum which is clearly smaller than the rest - this is the "null point", where the E & F sub-beams are lined up with the tracks on the disc.
5. From this null point, turn the grating screw clockwise (as seen from the underside of the PU unit) until the lissajous waveform is a single line (or close as possible) as shown in the photograph.

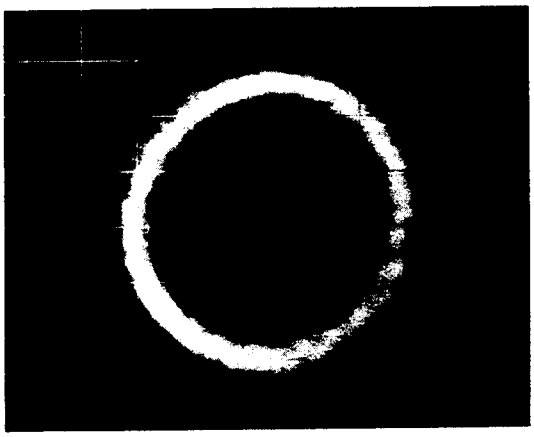
Lissajous figure (AC input)
Horizontal axis E 10mV/div.
Vertical axis F 10mV/div.

Null Point=180°



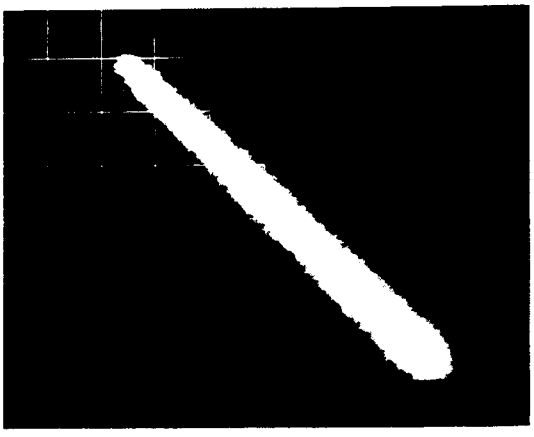
Waveform 4

"Rough" adjustment=90°



Waveform 5

Final adjustment=0°

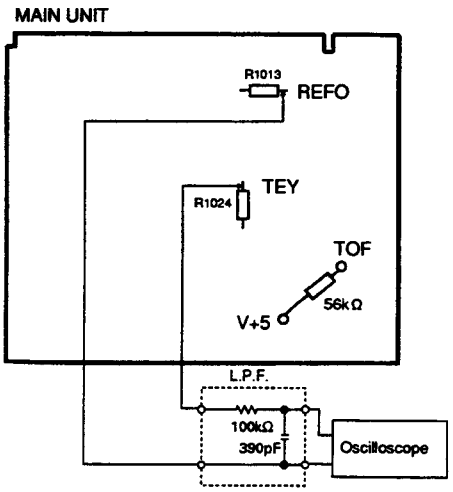


Waveform 6

## 4 Tracking Balance Adjustment 1

·**Purpose :**
To equate the sensitivity of the F channel to that of the E channel.
·**Symptoms of Mal-adjustment :**
Track search NG, Poor playability carriage runaway.

| | |
|---|---|
| ·**Measuring Equipment / Jig** | ·Oscilloscope, L.P.F. |
| ·**Measuring Point** | ·TEY |
| ·**Test Disc , Mode** | ·ABEX TCD-784 (or SONY TYPE 4), TEST MODE |
| ·**Adjustment Point** | ·VR1002 (T.BAL VR) |




Pull up the TOF terminal to the V+5 terminal with a 56kΩ resistor. (This is in order to cancel lens offset in the tracking direction.)
(Sub-number of the main unit's p.c.board is -C and after.)
NOTE: If the sub-number of the main unit's p.c.board is -B, it means there is no TOF terminal, so instead of attaching a pull-up resistor, adjust the item by tilting 45° in the direction where the grille is lifted.

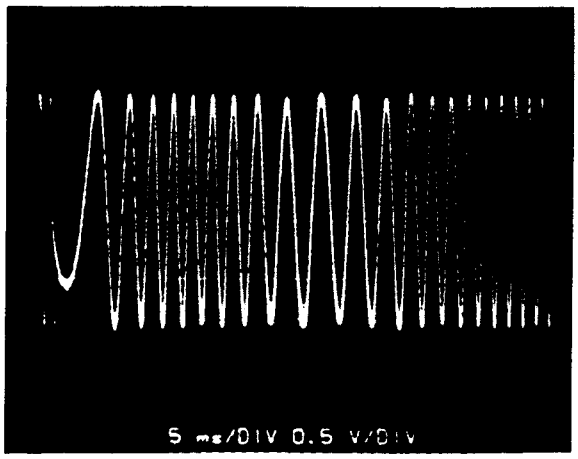
**Adjustment Procedure**
1.Load disc and switch the regulator on.
2.Position the PU unit in the center of the disc using the **FF & REV** keys.
3.Close focus by pressing key **9**.
4.Observing the TEY waveform on the oscilloscope, adjust VR1002 until the positive and negative halves have the same amplitude (see waveform 7–9).

**Check**
After adjustment the TEY waveform should have an amplitude of 1.5±0.65 Vpp (ABEX TCD-784 or SONY TYPE 4)
(Providing focus bias is OK)

DC Mode
0.5V/div.
5ms/div.

+5% NG

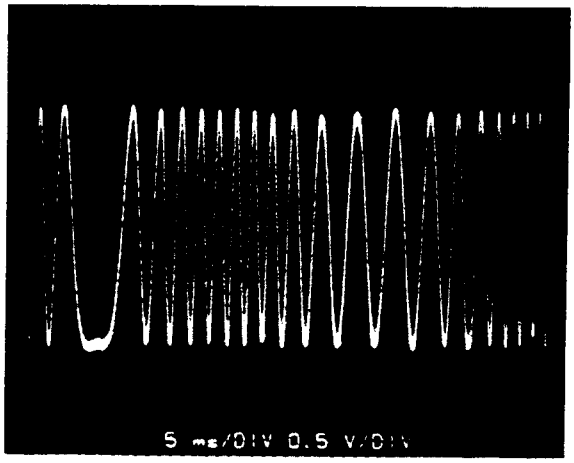
REFO →




Waveform 7

±0% OK

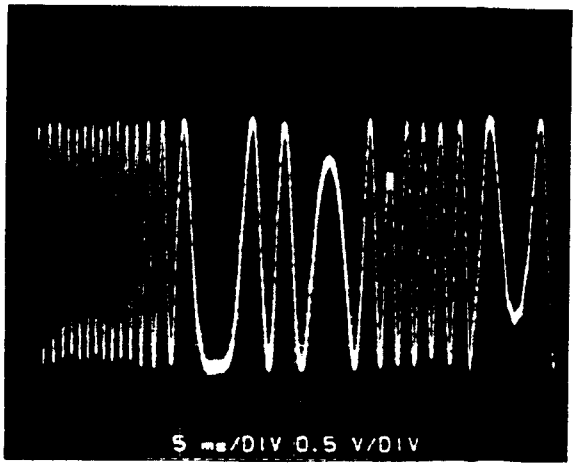
REFO →




Waveform 8

–5% NG

REFO →

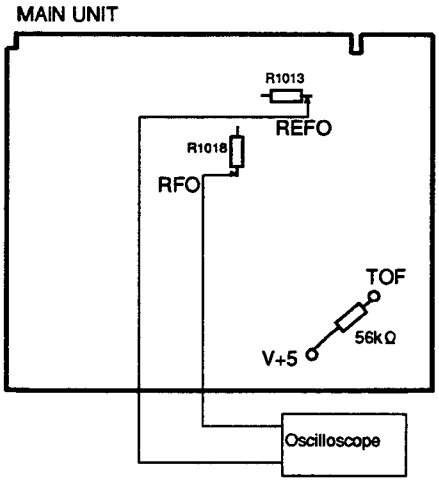



Waveform 9

## 5 Focus Bias Adjustment

·**Purpose :**
To adjust the focus servo reference so that the RF waveform is an optimum.
·**Symptoms of Mal-adjustment :**
Difficulty in closing focus, poor playability.

| | |
|---|---|
| ·**Measuring Equipment / Jig** | ·Oscilloscope |
| ·**Measuring Point** | ·RFO |
| ·**Test Disc , Mode** | ·ABEX TCD-784 (or SONY TYPE 4), NORMAL MODE |
| ·**Adjustment Point** | ·VR1003 (FE BIAS VR) |

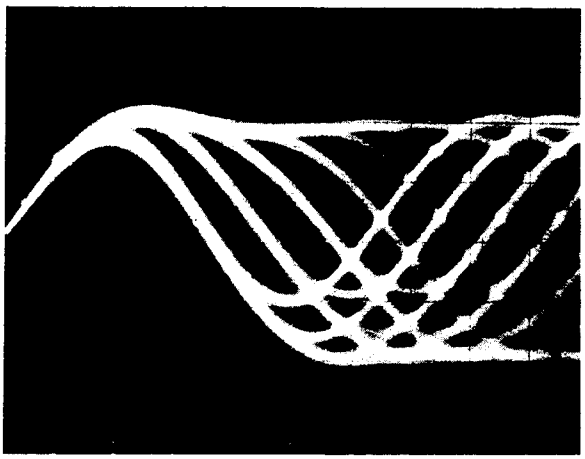



Pull up the TOF terminal to the V+5 terminal with a 56kΩ resistor.
(This is in order to cancel lens offset in the tracking direction.)
(Sub-number of the main unit's p.c.board is -C and after.)
NOTE: If the sub-number of the main unit's p.c.board is -B, it means there is no TOF terminal, so instead of attaching a pull-up resistor, adjust the item by tilting 45° in the direction where the grille is lifted.

**Adjustment Procedure**
1. Play track number 18.
2. Adjust VR1003 so that the RFO waveform amplitude is a maximum and eye pattern is optimum.

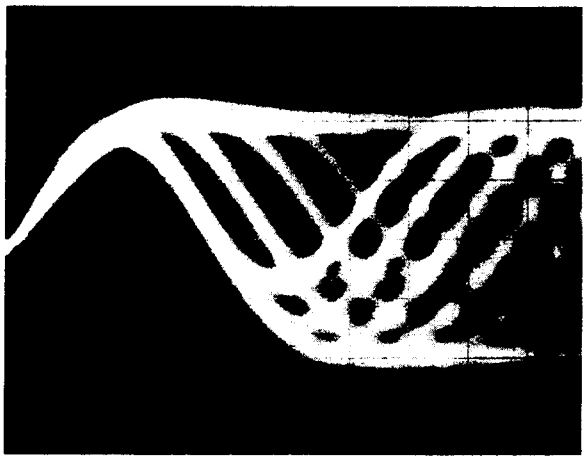
**Check**
After adjustment the RFO waveform should have an amplitude of 1.7±0.65 Vpp (ABEX TCD-784 or SONY TYPE 4)

3. Remove the pull-up resistor after completing adjustment.



OK

Waveform 10



NG

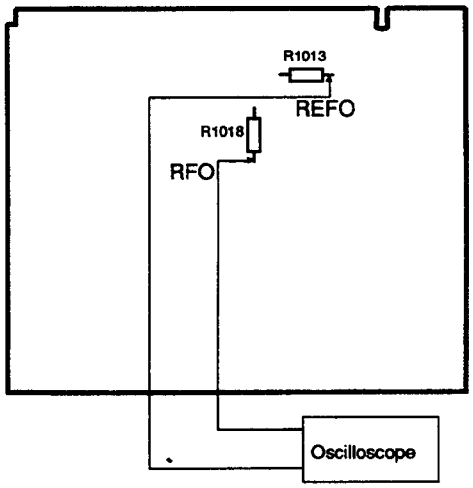
AC Mode Before adjustment Waveform 11

## 6 RFO Offset Adjustment

**·Purpose**
To adjust the RFO waveform offset to an optimum.
**·Symptoms of Mal-adjustment**
Difficulty in closing focus, poor playability.

| | |
|---|---|
| **·Measuring Equipment / Jig** | ·Oscilloscope |
| **·Measuring Point** | ·RFO |
| **·Test Disc , Mode** | ·ABEX TCD-784 (or SONY TYPE 4), NORMAL MODE |
| **·Adjustment Point** | ·VR1004 (RFO OFFSET VR) |

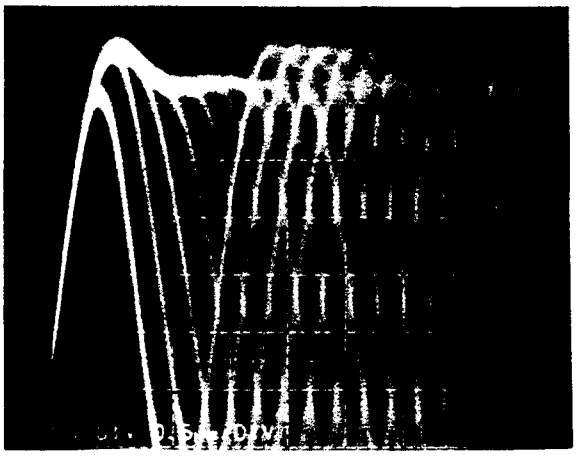
MAIN UNIT




**Adjustment Procedure**
1. Make sure the TOF terminal's pull-up resistor has been disconnected.
2. Play track number 18.
3. Adjust VR1004 so that the peak value of the upper envelope of the RFO waveform is at +1.1VDC w.r.t. REFO(See waveform 12–14).

DC Mode
0.2V/div.
0.5µs/div.

+100mV NG

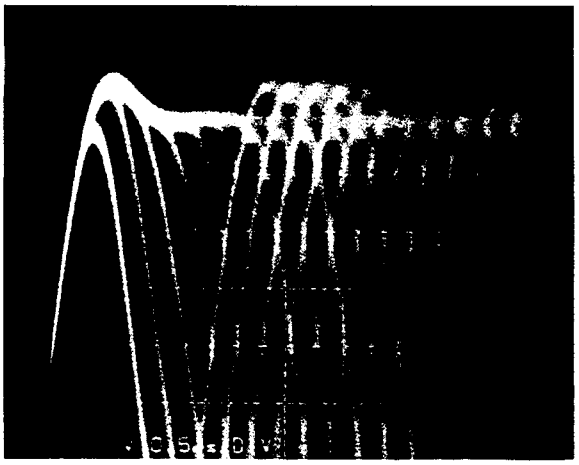


REFO →

Waveform 12

OK

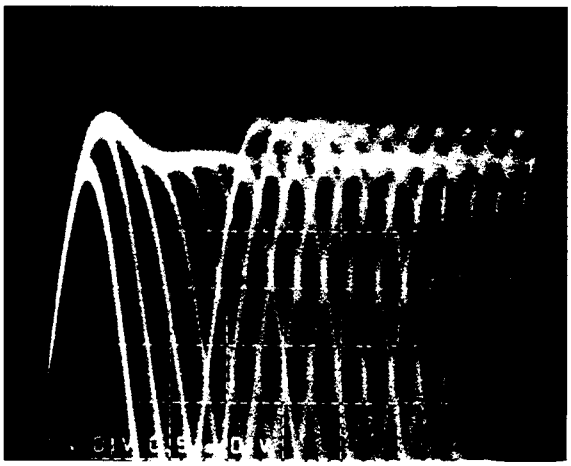
1.1V



REFO →

Waveform 13

−100mV NG



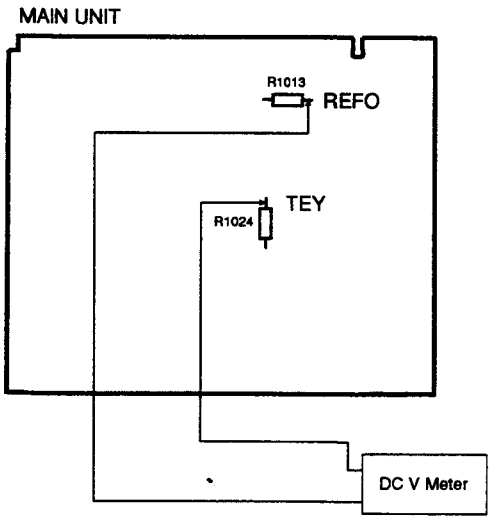
REFO →

Waveform 14

## 7 Tracking Error Offset Adjustment 2

·**Purpose :**
To check the offset of the tracking pre-amp is zero and adjust if necessary.
·**Symptoms of Mal-adjustment :**
Track search NG, Carriage runaway, Poor playability.

| | |
|---|---|
| ·**Measuring Equipment / Jig** | ·DC V Meter |
| ·**Measuring Point** | ·TEY |
| ·**Test Disc , Mode** | ·No disc, TEST MODE |
| ·**Adjustment Point** | ·VR1001(TE OFFSET VR) |

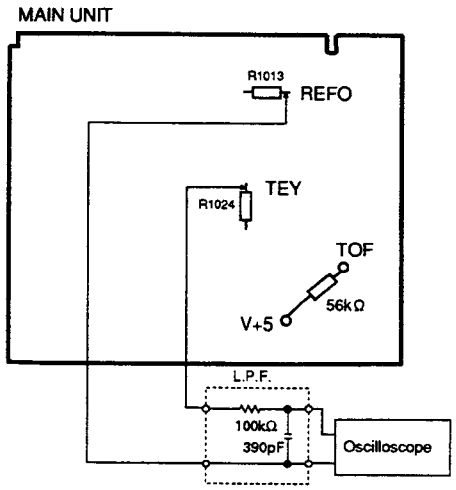



**Adjustment Procedure**
1.Switch the regulator on.
2.Using VR1001, adjust TEY to 0 ± 25mV w.r.t. REFO.

## 8 Tracking Balance Adjustment 2

·**Purpose :**
To equate the sensitivity of the F channel to that of the E channel.This needs only be done if the TE OFFSET volume was re-adjusted in the previous step.
·**Symptoms of Mal-adjustment:**
Track search NG,Poor playability, carriage runaway.

| | |
|---|---|
| ·**Measuring Equipment / Jig** | ·Oscilloscope, L.P.F. |
| ·**Measuring Point** | ·TEY |
| ·**Test Disc , Mode** | ·ABEX TCD-784 (or SONY TYPE 4), TEST MODE |
| ·**Adjustment Point** | ·VR1002 (T.BAL VR) |




Pull up the TOF terminal to the V+5 terminal with a 56kΩ resistor. (This is in order to cancel lens offset in the tracking direction.)
(Sub-number of the main unit's p.c.board is -C and after.)
NOTE: If the sub-number of the main unit's p.c.board is -B, it means there is no TOF terminal, so instead of attaching a pull-up resistor, adjust the item by tilting 45° in the direction where the grille is lifted.

**Adjustment Procedure**
1.Load disc and switch the regulator on.
2.Position the PU unit in the center of the disc using the **FF & REV** keys.
3.Close focus by pressing key **9**.
4.Observing the TEY waveform on the oscilloscope, adjust VR1002 until the positive and negative halves have the same amplitude (See waveform 7–9).
**Check**
After adjustment the TEY waveform should have an amplitude of 1.5±0.65 Vpp (ABEX TCD-784 or SONY TYPE 4)
5. Remove the pull-up resistor after completing adjustment.

## 4.2 NEW TEST MODE

### ● New Test Mode(aging operation and setup analysis)

The single CD player plays in normal mode. After being set up, it will display FOK (focus), LOCK (spindle), subcode, sound skip, protection against a mechanical error or the like, occurrence of an error, cause and time of an expiry, if any, (and disc number)

During the setup, the CD software operation status (internal RAM and C-point)is displayed.

**(1) How to enter NEW TEST Mode**

See the test mode flow chart Page 1-6.

**(2) Relations of keys between TEST and NEW TEST Modes**

| Keys | Test Mode | | New Test Mode | |
|---|---|---|---|---|
| | Regulator OFF | Regulator ON | PLAY in progress | Error Occurred, Protection Activated |
| BAND | Regulator ON | Regulator OFF | — | Time of occurrence/ cause of error select |
| FF | — | FWD-Kick | FF/TR+ | — |
| REV | — | REV-Kick | REV/TR- | — |
| 7 | — | Tracking close | SCAN | — |
| 8 | — | Tracking open | MODE | — |
| 9 | — | Focus close | — | — |
| 12 | To New Test Mode | Jump Mode Select | AUTO/MANU | TRACK No./ time of occurrence select |

Operations,such as EJECT, CD ON/OFF, etc. are performed normally

**(3) Error Cause (Error Number) Code**

| Error Code | Classification | Mode | Description | Cause/Detail | |
|---|---|---|---|---|---|
| 40 | ELECTRIC | PLAY | FOK=L 100ms | Put out of focus | Scratch, Stain, Vibration, Servo defect, etc... |
| 41 | ELECTRIC | PLAY | LOCK=L 100ms | Spindle unlock | |
| 42 | ELECTRIC | PLAY | Subcode unacceptable 500ms | Failed to read subcode | |
| 43 | ELECTRIC | PLAY | Sound skipped | Last address memory operated | |

**(4) Indicating an Operation Status During Setup**

| Status No. | Description | Protection operation |
|---|---|---|
| 01 | Carriage home mode started | None |
| 02 | Carriage moving inwards | 10-second time out, Home switch failed |
| 03 | Carriage moving outwards | 10-second time out, Home switch failed |
| 05 | Carriage moving outwards | None |
| 11 | Setup started | None |
| 12 | Spindle turn/Focus search started | None |
| 13 | Waiting for focus closure (XSI=L) | Failure to close focus |
| 10,14 | Waiting for focus closure (FOK=H) | Failure to close focus |
| 15, 16, 17 | Focus closed, Tracking open | Focus disrupted |
| 18 | During focus AGC | Focus disrupted |
| 19 | During tracking AGC | Disrupted focus |
| 20 | Waiting for MIRR, LOCK or subcode read Carriage closed, SPINDLE=ADAPTIVE | Focus disrupted, MIRR NG, Failure to lock, failed to read subcode |

**(5) Example of Display.**

·SET UP in progress

8 digits

| TNo. | Min | Sec |
|---|---|---|
| 11 | 11 | 11 |

4 digits(Auto)

| TNo. |
|---|
| 11 |

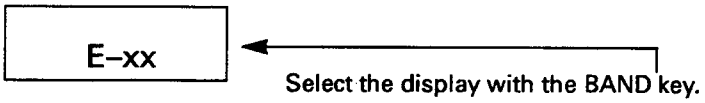
4 digits(Manual)

| Min | Sec |
|---|---|
| 11 | 11 |

·Operation (PLAY, SEARCH, etc.) in progress perfectly identical with that in the normal mode.

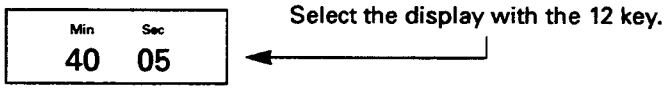
·Protection/Error upon occurrence(4 digits display)

(a) Error number indicated



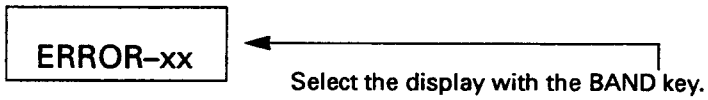

(b) Track number indicated

(c) Absolute time indicated




·Protection/Error upon occurrence(8 digits display)

(a) Error number indicated




(b) Track number and absolute time indicated

## ● Error Number Indication

If the CD should fail to operate or if an error has taken place during operation the player will enter into the error mode, and the cause of the error will be numerically indicated.
This is aimed at assisting in analysis or repair.

**(1) Basic Means of Display**

·Examples of Display E-XX

**(2) Error Codes**

| Error Code | Classification | Description | Cause/Detail |
|---|---|---|---|
| 10 | ELECTRIC | Carriage home failure | Carriage doesn't move to or from the innermost position<br>→Home switch failed and/or carriage immobile |
| 11 | ELECTRIC | Focus failure | Focus failed<br>→Defects, disc upside-down, severe vibration |
| 12 | ELECTRIC | SETUP failure<br>Subcode failure | Spindle failed to lock or subcode unreadable<br>→Spindle defective, defect, severe vibration |
| 14 | ELECTRIC | Mirror failure | Unrecorded CD-R<br>The disc is upside-down, defects, vibration |
| 17 | ELECTRIC | Set up failure | AGC protect failed<br>→Defects, disc upside-down, severe vibration |
| 30 | ELECTRIC | Search time out | Failed to reach target address<br>→Carriage/tracking defective and/or defects |
| A0 | SYSTEM | Power failure | Power overvoltage or short circuit detected<br>→Switching transistor defective and/or power abnormal |
| 50 | MECHANISM | An error upon ejection | MAG switch release time has time out<br>Elevation time out when eject |
| 60 | MECHANISM | An error while putting in and out the tray | Tray in / out time has time out<br>Tray is caught when put in |
| 70 | MECHANISM | An error upon elevation | Elevation time has time out |
| 80 | MECHANISM | An error with an empty magazine inserted | No disc is available |

# 5. CIRCUIT DESCRIPTION

## 5.1 PRE-AMPLIFIER STAGE (UPC2571GS)

The optical signals are converted to voltage signals using an i/v amplifier inside the PU unit.

These voltage signals (A - F) are further processed by this pre-amp stage.

The pre-amplifier performs the following tasks

- Automatic power control of the PU unit's laser diode.
- Generation of an equalized RF signal from the photo-detector outputs (A - D).
- Generation of a focus error signal from the photo-detector outputs (A - D).
- Generation of a tracking error signal from the photo-detector outputs (E & F).
- Generation of a tracking zero crossing signal from the photo-detector outputs (E & F).

This IC runs from a single voltage supply (+5V). The reference voltage for this IC, the PU unit, and all the servo circuitry is REFO. This is obtained from pin 19 of the pre-amp ; which in turn is derived from the output REFOUT of the servo LSI, IC1201, UPD63700GF. The voltages REFOUT and REFO should be at +2.5V DC with respect to GND. All measurements and observations should be made using REFO as the reference as this is a buffered output. Care should be taken not to inadvertently short REFO to GND.

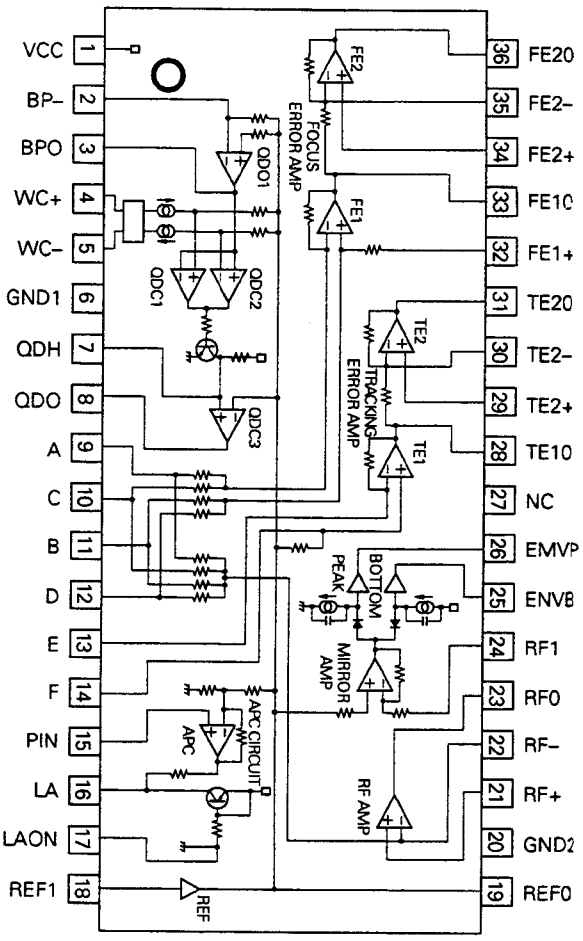



Fig.8 : UPC2571GS BLOCK DIAGRAM

### 1) Automatic Power Control (APC)

The laser diode's junction voltage varies greatly with temperature ; causing large output variations in optical power. To avoid this, a monitor diode is used in a feedback circuit to keep the optical power constant. As two different manufacturer's laser diodes are used the LD current falls into two broad bands : approx. 40mA and approx. 60mA.

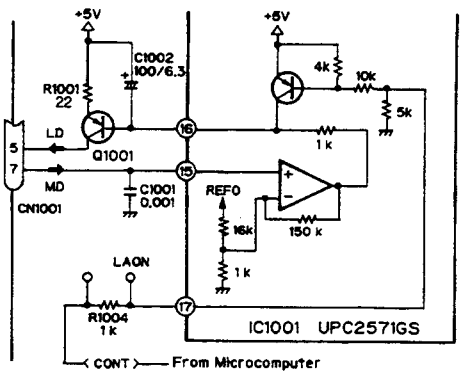



Fig.9 : APC CIRCUIT

### 2) RF Amplifier

This performs a simple summation of the photo-detector outputs A,B,C & D, amplifies, and equalizes to produce the RF signal at RFO. The RF eye pattern may be monitored here. The RFO OFFSET volume is used to ensure that the RFO waveform has the correct offset relative to the FOK threshold level inside the servo LSI UPD63700GF. The FOK signal is used in the focus close sequence, and during play to control the defect circuit inside the UPD63700GF.

The AC coupled RFO signal, RFI, is used by the UPD63700GF to generate the EFM signal which is used in turn by the DSP spindle CLV control sections.

For low frequency signals :

VRFO = (A+B+C+D) x (R1018+R1019)/10k = (A+B+C+D) x 6.22

The RFO waveform should have an amplitude of approx. 1.9Vpp, with it's upper envelope at +1.1V DC w.r.t. REFO.

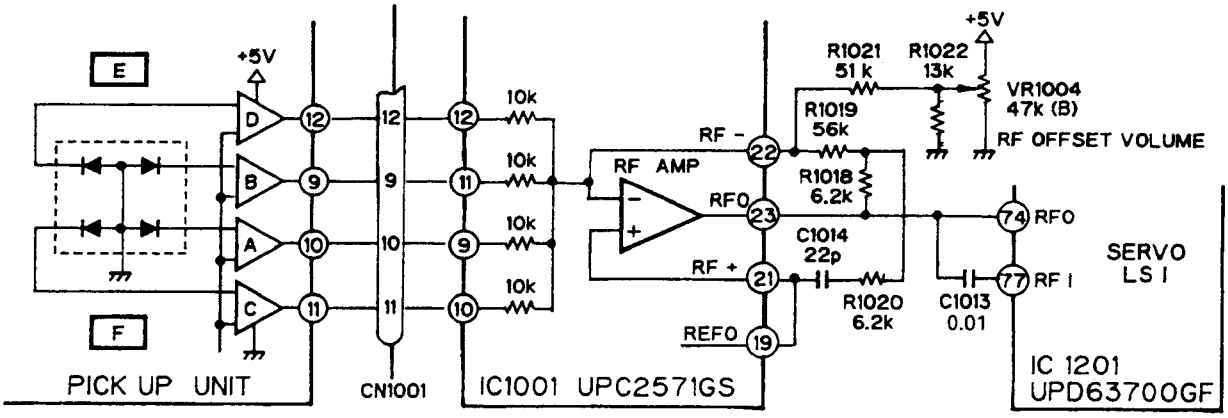



Fig.10 : RFO AMPLIFIER

### 3) Focus Error Amplifier

This produces a focus error signal used as the basis for the focus servo:

VFEY = ( (A+C)-(B+D) ) x 5 x (R1007//20k)/10k

= FE x 6.23 (FE = PU unit focus error)

The S-Curve at FEY should have an amplitude of approx. 1.9Vpp.

The second amplifier stage is also a low pass filter, fc=11kHz, and has a bias volume adjustment. This adjustment is used to vary the reference bias level of the focus servo loop and is adjusted to obtain an optimum eye pattern at RFO.

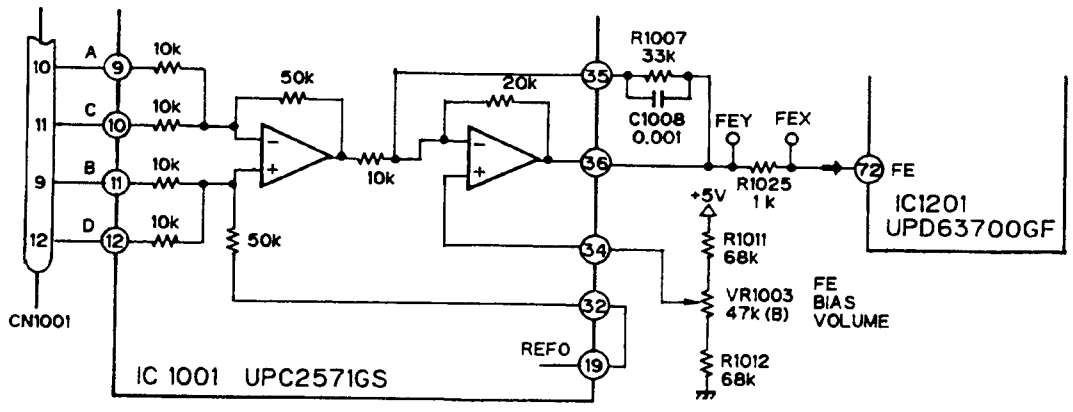



Fig.11 : FOCUS ERROR AMPLIFIER

### 4) Tracking Error Amplifier

This produces the tracking error signal used in the tracking servo loop.

VTEY = (25 x E) - (25 x F x 2 x 10k / (T.BAL+10k) )

Normally, the sensitivity of E & F are the same and T.BAL=10k

=> VTEY = 25 x (E-F)

If, however, the E and F sensitivities are different the T.BAL volume can be used to cancel out the unbalance. The offset adjustment TE OFFSET is to cancel any DC offsets from the photo-detectors or op-amps to ensure the reference bias for the servo loop is at zero. Maladjustment of either of these pre-sets will result in poor tracking performance and susceptibility to skipping.

For a typical unit, the TEY level should be approx. 1.8 Vpp.

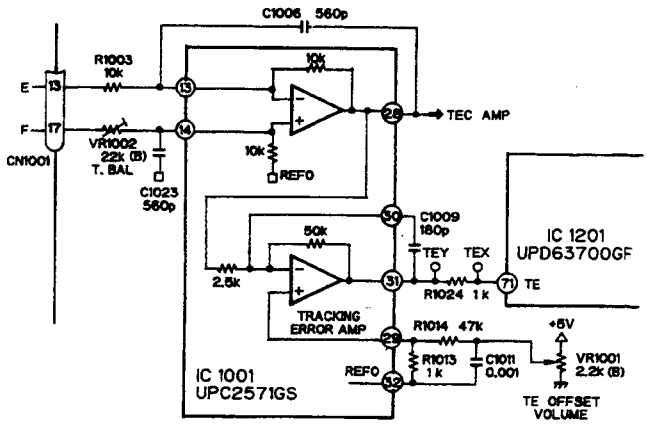



Fig.12 : TRACKING ERROR AMPLIFIER

### 5) Tracking Zero Crossing Amplifier

TEC1 is basically an amplified, AC coupled, version of the TEY waveform. It is used by the servo LSI IC1201, UPD63700GF to located the zero crossing points of the TEY signal to :

1) Determine how many tracks have been crossed during track jumping or a carriage move operation.
2) Determine in which direction the lens is moving when attempting to close tracking. This is used in the "tracking brake" circuit described later.

For signals in the range 500Hz - 5kHz :

VTEC1 = R1005/R1006 x (E-F) = 45.5 x (E-F)

Typically TEC1 is around 4.2Vpp, this means that the TEC1 signal level may be greater than the saturation limit of the op-amp and the signal will clip. However, since the servo LSI only uses the zero-crossing points, this is not critical.

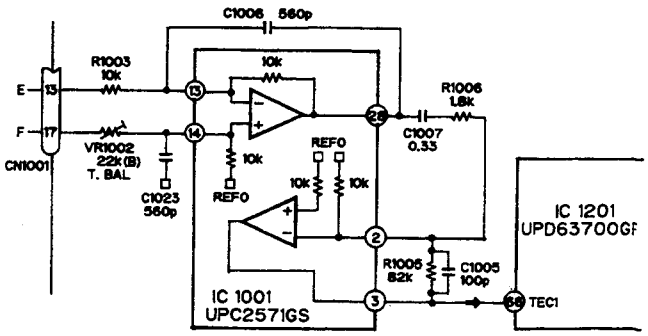



Fig.13 : TRACKING ZERO CROSSING AMPLIFIER

## 5.2 SERVO STAGE (UPD63700GF)

All the servo equalization & sequencing, such as focus closing, track jumping, carriage moving etc. are performed in this LSI, as well as all the DSP functions : data decoding, error protection, interpolation etc. The signals FE & TE are digitized and processed by the servo block to produce the focus, tracking & carriage drive signals, in a PWM format.

The RFI signal is converted to the EFM signal which is decoded by the DSP block to produce an audio signal ; during this process, a spindle servo error signal is also generated and used by the servo block to produce a spindle drive signal, again in PWM form.
The PWM waveforms are filtered, to remove the PWM carrier, amplified by the driver IC1401 XRA6797FP, and output to the corresponding actuators.

### 1) Focus Servo System

The main focus equalization takes place inside the UPD63700GF (figure 14). The equalizer response can be measured between FEX and FIN and has the shape shown in figure 15.

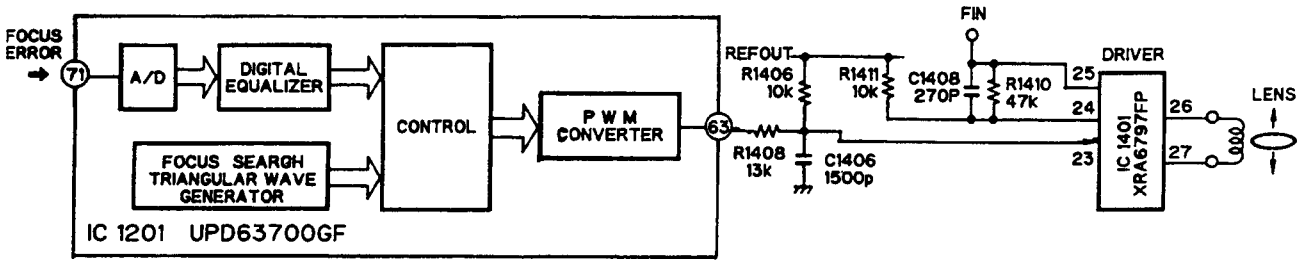



Fig.14 : FOCUS SERVO BLOCK DIAGRAM

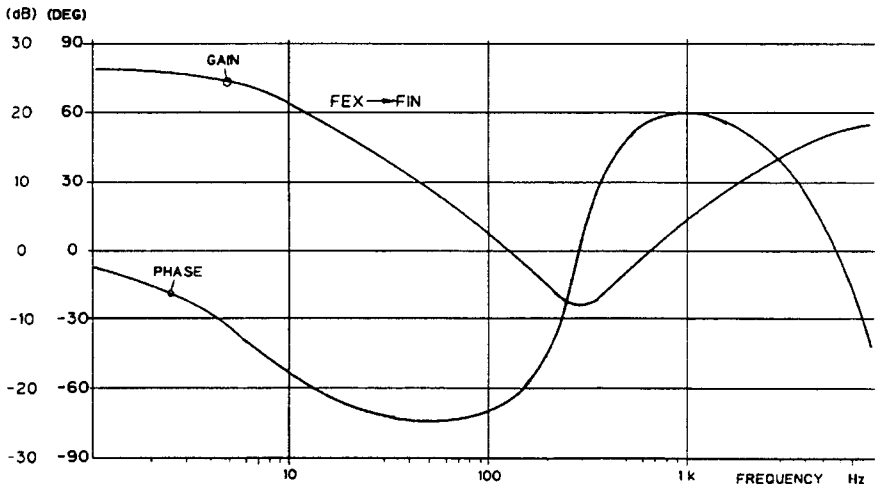



Fig.15 : FOCUS EQUALIZER

In order to smoothly close focus the lens must first be within approx. 5µm of the "just focused" position. This position is achieved by a focus search sequence. The lens is moved up and down using a triangular wave search voltage while the spindle motor is kicked and kept rotating at an appropriate speed. The servo LSI monitors the FE and RFO signals and, at an appropriate point, automatically closes focus.

The conditions for focus close are :

1) The lens is moving from a far to a near position relative to the disc,
2) FOK = HIGH (5V),
3) FZD (IC internal signal) was latched high and
4) FE = 0 (w.r.t. REFO).

When the focus servo closes, the servo LSI's serial data output port, XSO, will show a high-low transition. This is received by the microcomputer as an indication that the servo loop was closed and after about 25mS it begins monitoring the FOK output, via a LPF, to verify that focus is still closed ; in the event of FOK becoming low for an appreciable time, the microcomputer will take appropriate action.

The various signal levels which contribute to focus close are shown in figure 16, which shows the case where focus close has been inhibited.

In TEST MODE, using FOCUS CLOSE MODE 1, conditions 2 & 3 can be inhibited to allow the S-Curve, focus search voltage and the actual lens movement to be observed at ease.

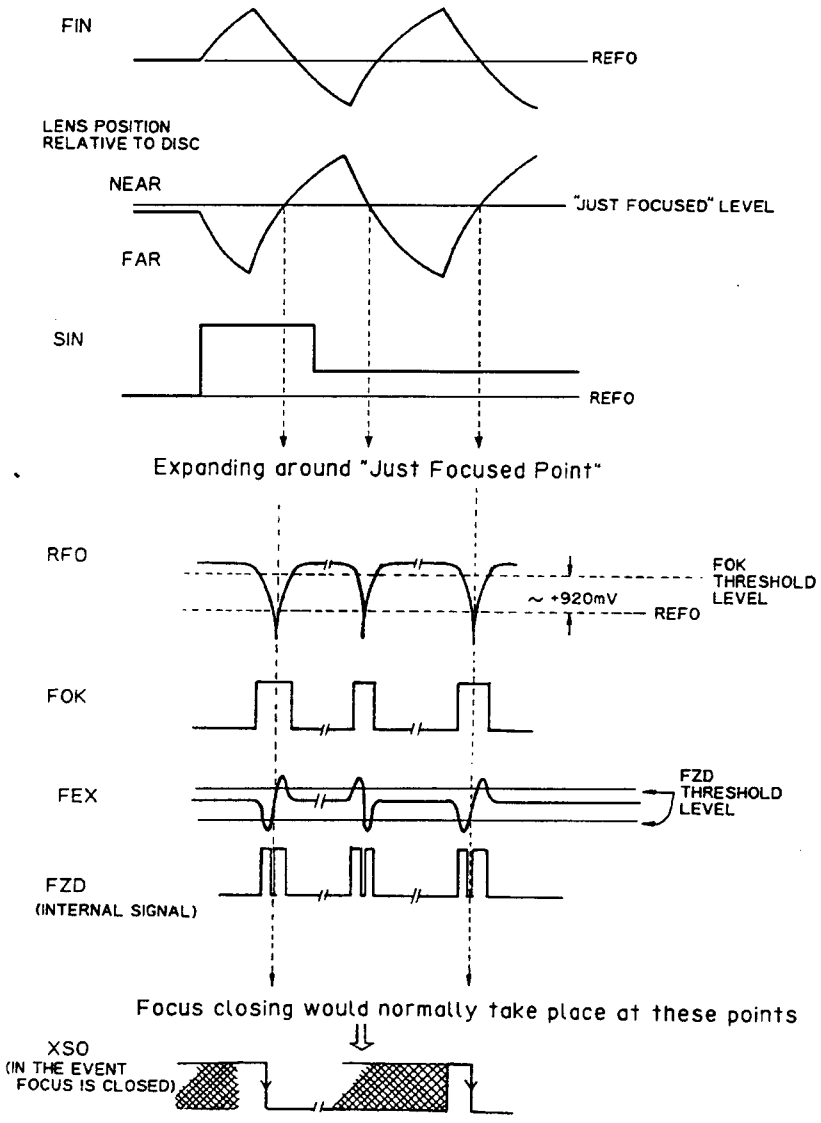



Fig.16 : FOCUS CLOSING SEQUENCE

a) FOK CIRCUIT

The FOK circuit inside the servo LSI compares the lower envelope of the RFO signal with a threshold level fixed by the microcomputer. Should the envelope level fall below this FOK level then FOK becomes high. This is used during focus close as stated and also during play to control a defect circuit, which switches the focus & tracking servos into a hold mode should the RFO envelope become disrupted by dirt, grease etc, thus increasing the player's defect response (figure 17).

The FOK threshold is approx. +920mV w.r.t. REFO. It is for this reason that the upper envelope should be adjusted to +1.1V DC w.r.t. REFO.

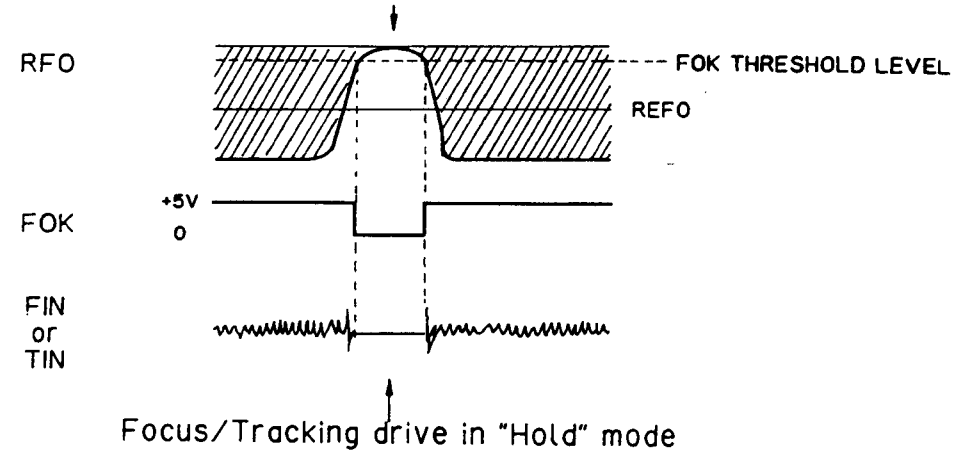



Fig.17 : DEFECT CIRCUIT

b) FZD CIRCUIT

The FZD circuit inside the servo IC compares the absolute value of the FE signal to a threshold value and outputs a high/low signal which is then used in the focus close sequence as stated.

At power on, the microcomputer switches the laser diode off and reads the value of the FE bias via the servo LSI's A/D port. The FZD threshold is set 200mV above this bias level.

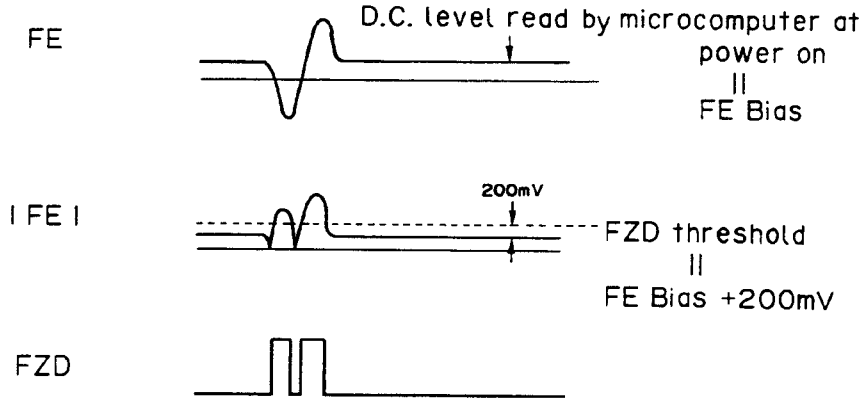



Fig.18 : FZD CIRCUIT

### 2) Tracking Servo System

The main tracking equalization takes place inside the UPD63700GF (figure 19 ). The equalizer response can be measured between TEX and TIN and will have the shape shown in figure 20.

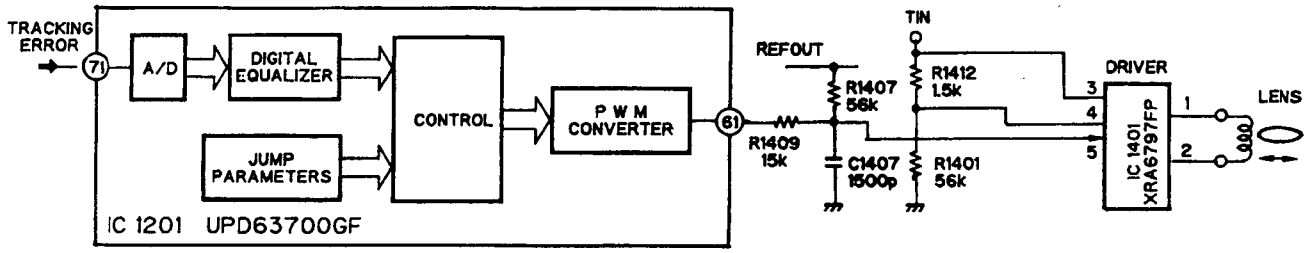



Fig.19 : TRACKING SERVO BLOCK DIAGRAM

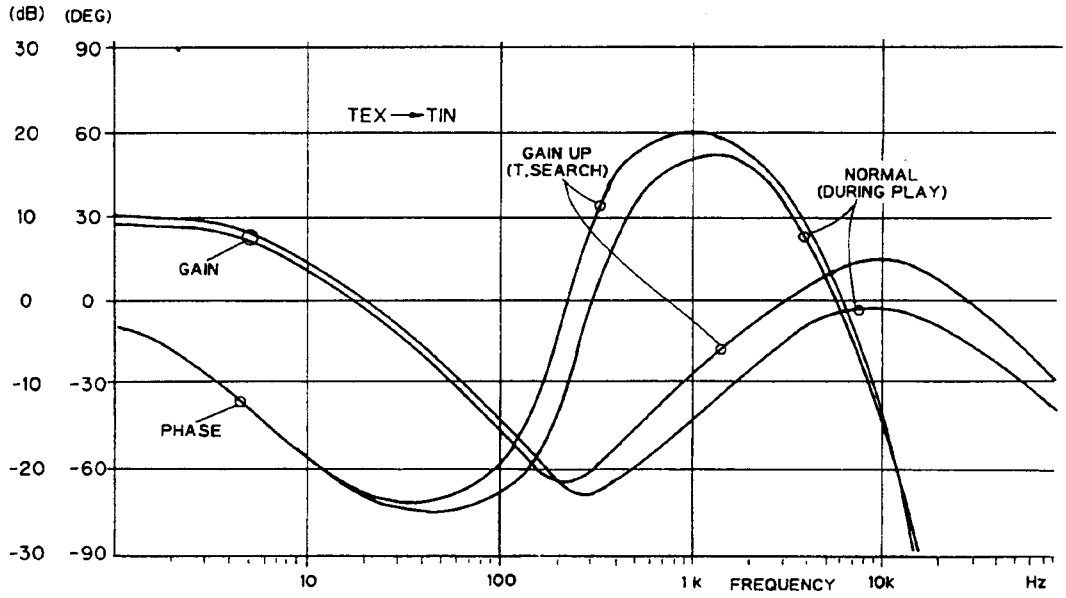



Fig.20 : TRACKING EQUALIZER

a) Track Jumping

Track jumping is performed automatically by the servo LSI upon receipt of the appropriate command from the microcomputer. The present microcomputer is programmed to use 1,4,10 & 32 track jump commands to achieve searching. The 32 track jump command may be used in pairs (64 tracks) or triplets (100 track) as required. In TEST MODE the 1,4,10,32 & 100 track jump and carriage move sequences may be observed by selecting the appropriate mode.

Note that the number of tracks jumped is controlled by setting an internal counter to half the total value and then counting this down using the zero crossing edges of TEC1. Once the counter is at zero, a brake pulse of fixed duration is output to bring the lens to a halt; allowing tracking to be closed and normal play to continue.

For a fixed period of time after a multi-track jump has been performed, a "tracking brake" circuit is activated in conjunction with a "gain-up" equalizer to ensure that the servo achieves stabilization before entering normal play.

Manual track search, in normal mode, uses a group of single track jumps to achieve FWD/REV at approx. ten times normal play speed.

The figures 21 & 22 show the timing charts for the single-track jump and multi-track jump commands.

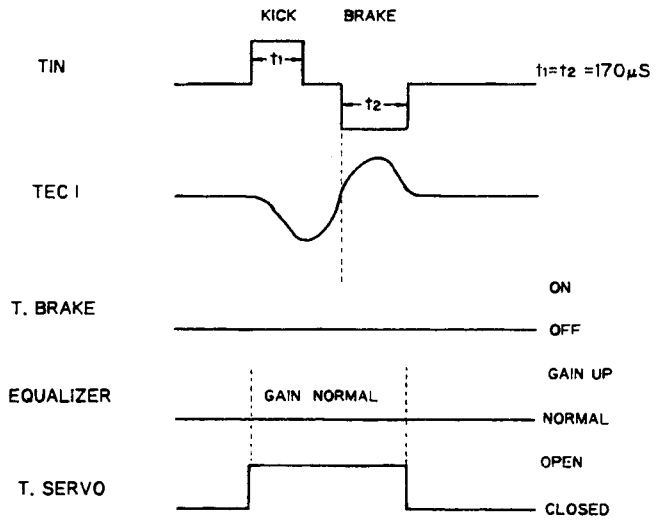



Fig.21 : SINGLE TRACK JUMP

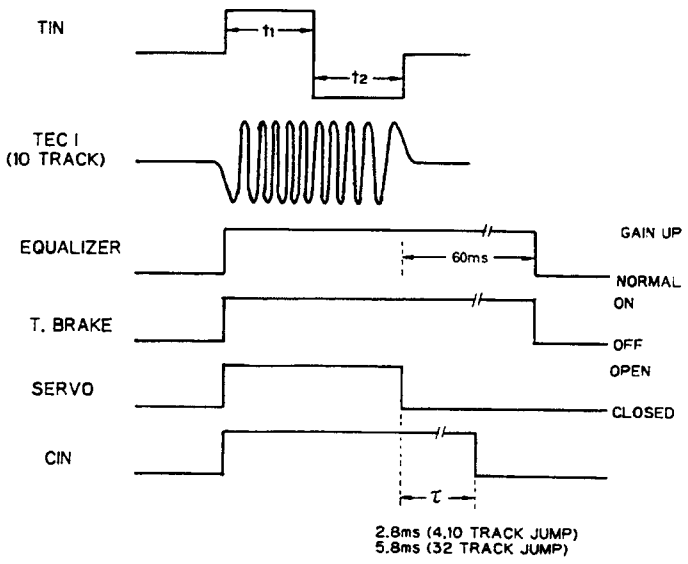
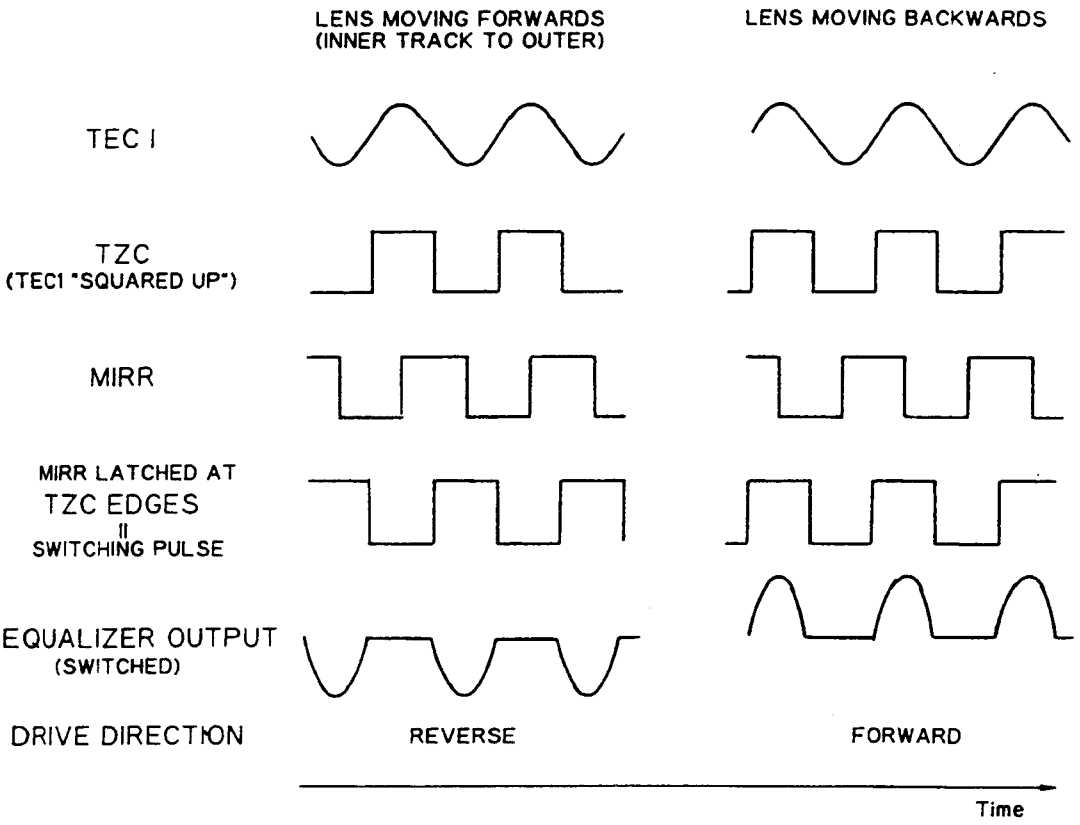



Fig.22 : MULTI TRACK JUMP

b) Tracking Brake Circuit (Figure 23)

This relies on determining which direction the lens is moving and only outputting the portion of the drive waveform which acts to oppose this motion. Direction of motion is deduced from TEC1 and the MIRR signal and knowledge of their phase relation.




Note : Equalizer output assumed to have same phase as TEC1.

Fig.23 : TRACKING BRAKE CIRCUIT

c) MIRROR Circuit

The MIRR circuit indicates if the laser beam is on or off track.

MIRR = 'H' => off track, MIRR = 'L' => on track.

MIRR is generated by detecting the upper and lower envelopes of the RFO waveform and producing a difference signal which is then compared with a peak-held version of itself to determine if the envelope size has dropped below a certain percentage.

If so, this is assumed to be due to the beam going off-track ; in practice dirt on the disc can also give the same effect (see figure 24).

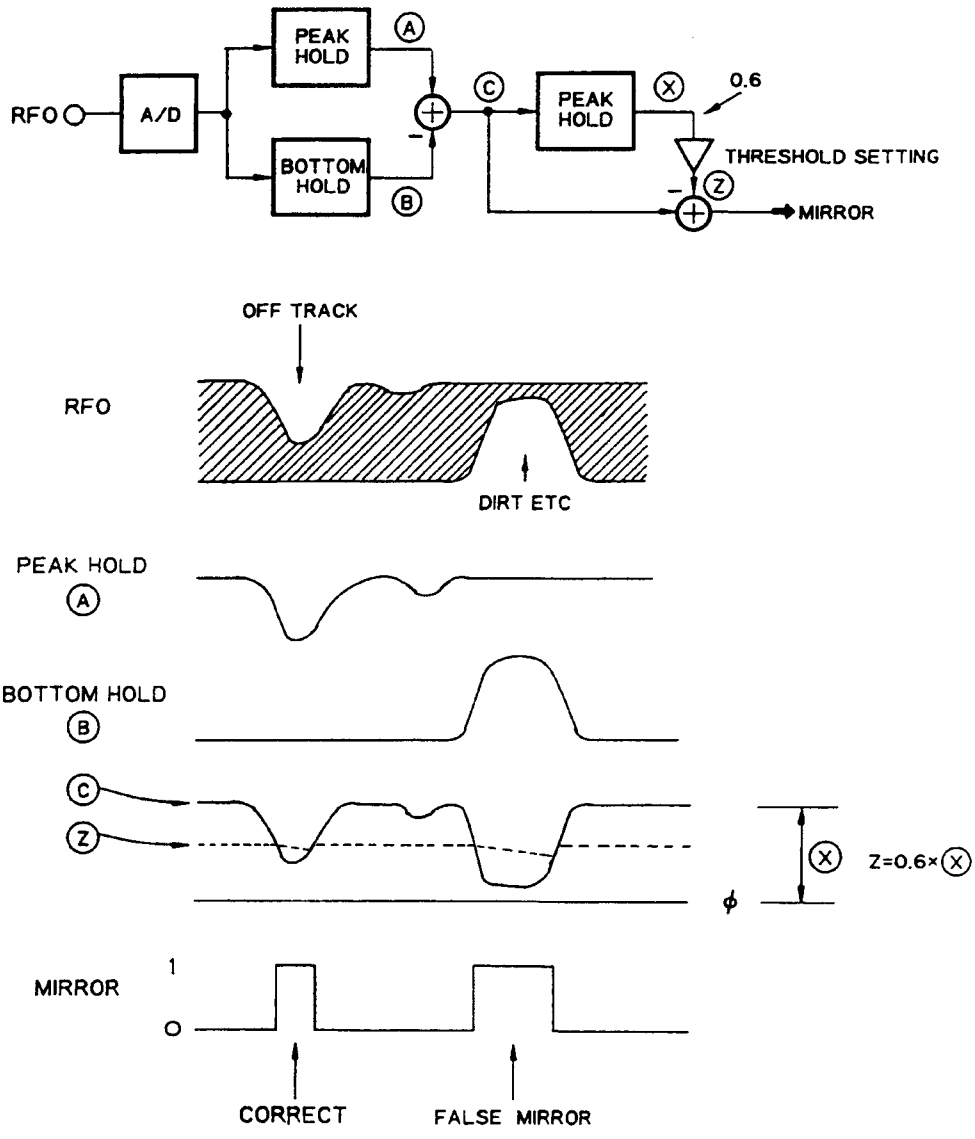



Fig.24 : MIRROR CIRCUIT & SIGNAL DIAGRAM

### 3) Carriage Servo System

The carriage servo system takes it's input from the low frequency component of the tracking equalizer output. This is amplified and equalized, and the output fed to the carriage motor via the PWM converter, LPF and driver IC. The gain of the equalizer is set so that when the lens is offset from it's center by a set amount the voltage at the carriage motor is enough to overcome friction and move the carriage forward.

Because the carriage motor will only begin moving when the applied voltage is great enough to overcome friction the drive voltage is cut-off inside the servo LSI until it reaches an appropriate level ; thus saving on wasted power dissipation.

Due to eccentricity of the disc etc. the threshold level may be crossed several times before the carriage assembly actually moves. This can result in a series of pulses being applied to the carriage motor.

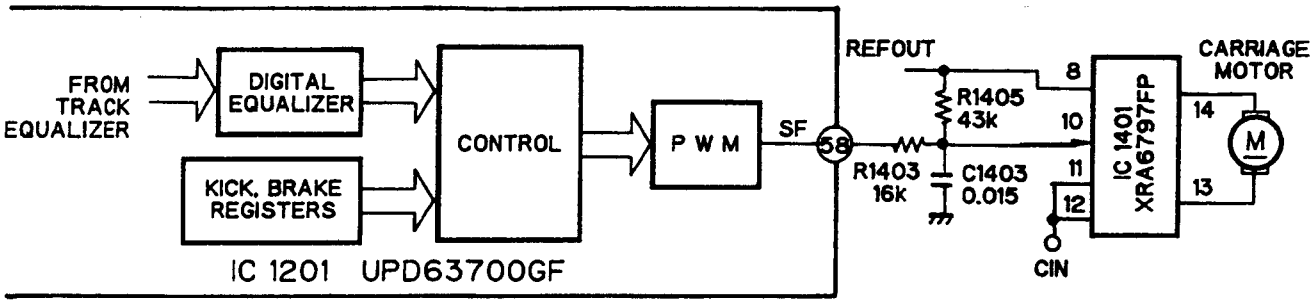



Fig.25 : CARRIAGE SERVO CIRCUIT

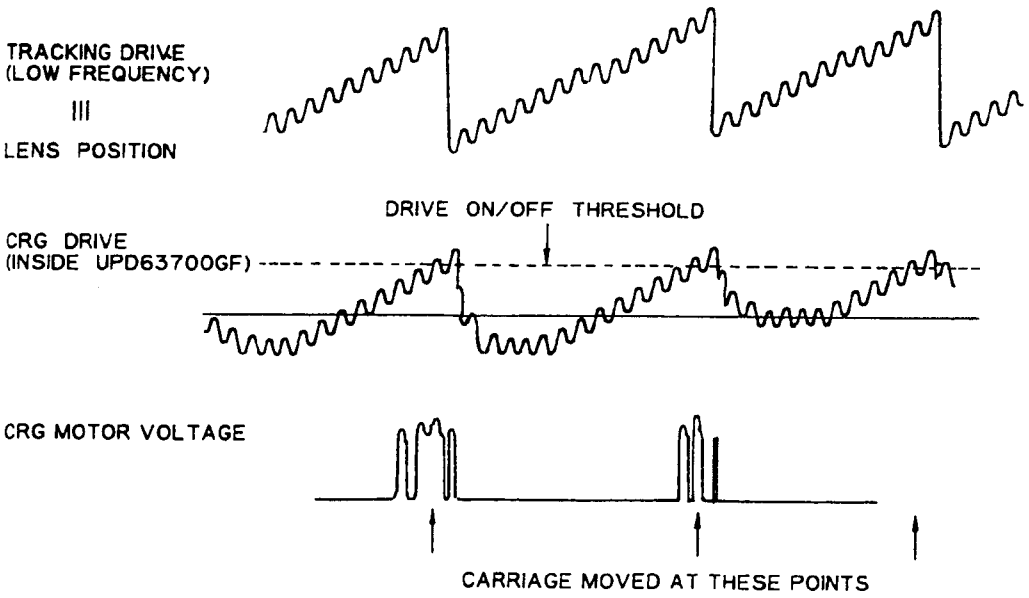



Fig.26 : CARRIAGE WAVEFORM

### 4) Spindle Servo

The spindle servo has a number of different modes :

(i) Kick : Used at set-up to bring the spindle up to speed from stand-still.

(ii) Offset : This is used i) At set-up, after spindle kick and before AGC has finished.
ii) During play if focus is suddenly disrupted.

(iii) Adaptive Servo : This is the CLV mode which ensures that the linear velocity of the disc as seen by the laser spot is kept constant. During play, a timing signal is extracted from the EFM signal and used to generate speed and phase error signals. These error signals are summed and fed into a servo equalizer to produce a drive signal via the PWM converter.

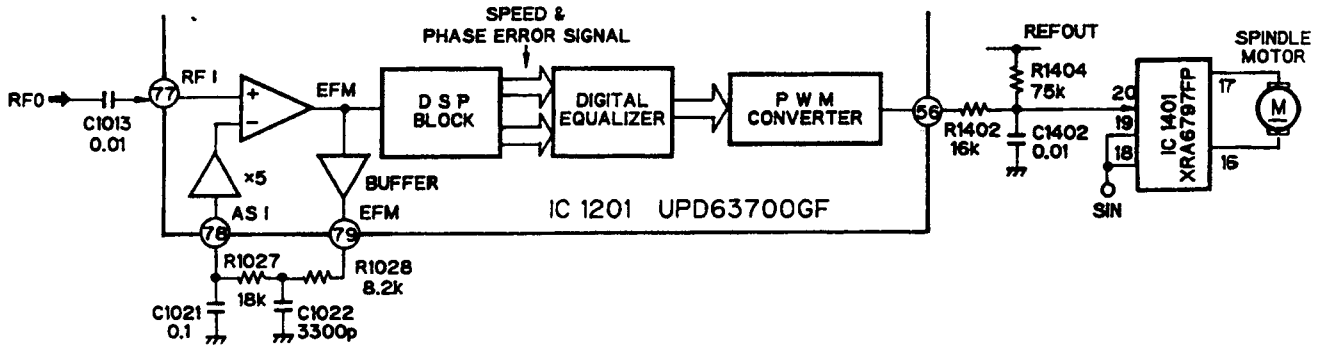
(iv) Brake : This is used to bring the disc to a stop quickly, for ejection or when CD source is de-selected or for any other reason. The servo LSI puts out a brake level and monitors the EFM signal. When the longest pattern in the EFM signal is longer than a fixed amount an internal flag is set. By monitoring this flag the microcomputer can judge when the disc has stopped and proceed to eject etc. If this flag is not set within a certain time limit the servo is switched to STOP mode and eject is implemented after a wait period.

(v) Stop : This occurs at power on or during disc eject. The spindle motor voltage is zero.

(vi) Rough : This is used in normal mode to control the linear velocity of the disc when the carriage is being moved for fast access. A speed signal is deduced from the EFM waveform and input to the spindle equalizer. This mode should be used in TEST MODE to perform the grating adjustment.

a) EFM Comparator

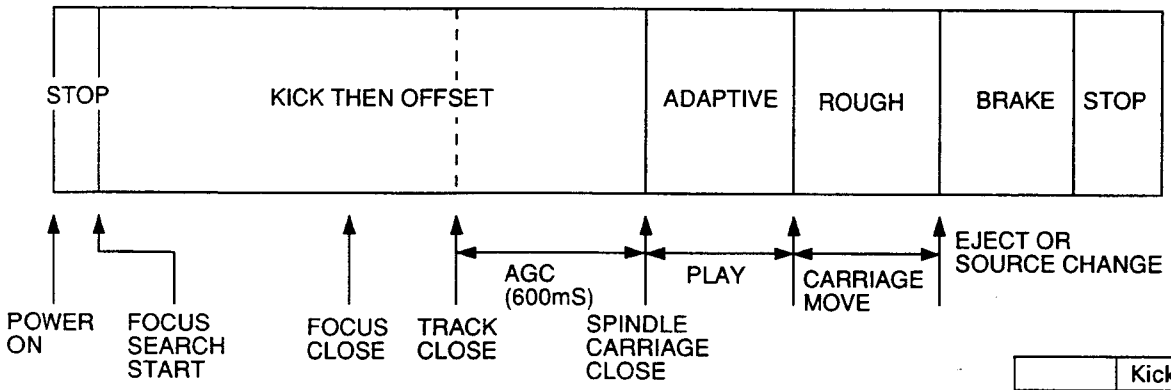
This circuit 'squares' up the analog RF signal into a digital EFM signal. In order to ensure minimum errors it is necessary to use a feedback circuit to match the DC level of the threshold to the center of the RF waveform. This circuit (shown in the spindle servo block diagram) uses the fact that the EFM signal should have no DC component. By feeding back the EFM signal's DC level the threshold level changes until the DC level is zero and the threshold, by definition, is at the exact center of the RFI waveform. The filtering in the feedback has been adjusted to ensure minimum error.




(EFM Compalator Circuit)

Fig.27 : SPINDLE CIRCUIT

● **Normal Mode**




| | Kick Time |
|---|---|
| 12cm | 800mS |
| 8cm | 300mS |

● **Test Mode**

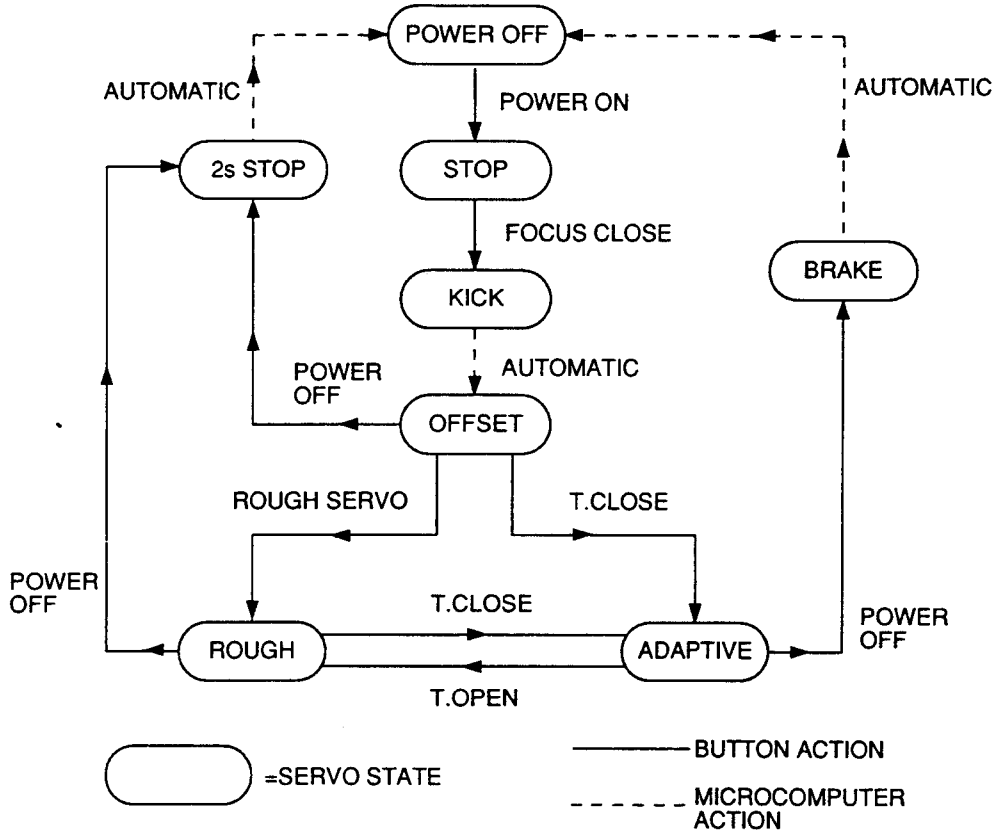



Fig.28 : SPINDLE SERVO MODES

### 5) Automatic Gain Control (AGC)

The servo LSI UPD63700GF contains a new function which allows the microcomputer to automatically adjust the gain of the focus and tracking servos every time a new disc is inserted or the CD source is selected. The block diagram of the AGC circuit is shown in figure 29. Basically, a small disturbance signal is inserted into the servo loop at a fixed frequency and the response of the loop is measured via the filtered signals G1 and G2. For a properly adjusted servo loop the amplitudes of G1 and G2 should be equal. The microcomputer reads in these values, does a simply calculation and adjusts the loop gain appropriately.

In order to achieve a high degree of accuracy this adjustment is performed a number of times.

As long as there is power supplied to the microcomputer it remembers the previous adjustment point and uses this as a starting point. Thus, should the system degrade with time (actuator sensitivity, dirt build-up, circuit degradation etc.) the microcomputer can follow this trend and keep the loop gain optimized.

If power to the microcomputer is removed, it forgets the previous adjustment point and assumes a default value.

At shipping the CD player will be within 5dB of this default and no problems should occur. For an older player however this is not so and it is possible that servo closure may not take place immediately. In this case, the microcomputer adjusts the gain 'blind', searching for a stable point.

In TEST MODE, the result of the AGC can be monitored. Once tracking close (with AGC) has been performed the set can be made to display the present value of the gain block. The default value is displayed as '20', which is the value a typical PU unit, PCB & test disc would result in. If for some reason the loop gain had dropped by, say, 6dB (1/2 the typical value) then the gain block will be adjusted during AGC to twice it's default value ; resulting in a gain of '40'. Similarly a set with a loop gain twice the typical will display '10' as the present gain.

Using this, it is possible to 'measure' the loop gain of the servo without the need for any instrumentation. The players shipped from the factory are checked with a test disc so that the value of the gain block after AGC is within the range 11 - 45.

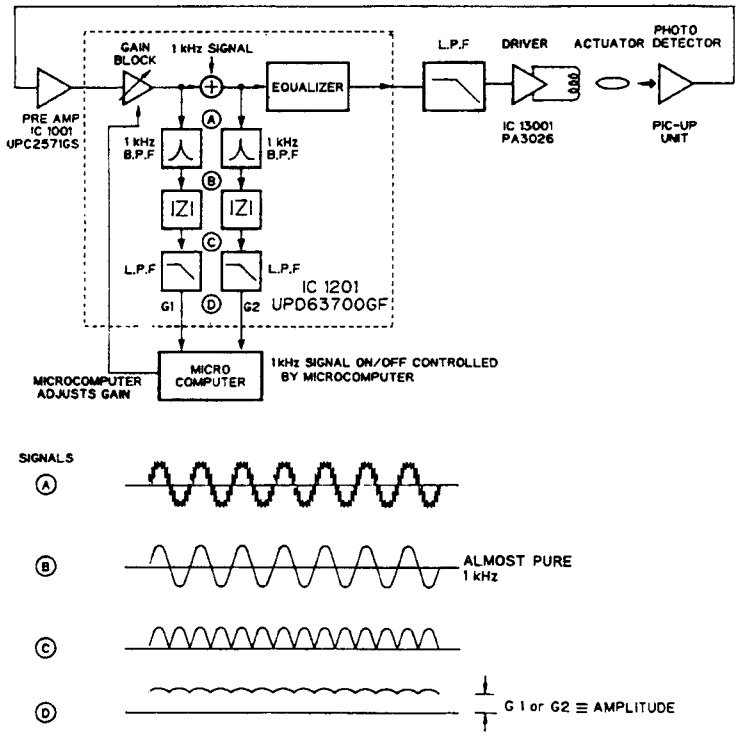



Fig.29 : AGC BLOCK DIAGRAM

## 5.3 Power Source Configuration

The power source for this system consists of seven separate sources which are the SVC (5.2V), VDD (5.0V), VLED (8.5V), 5VA (5.0V), DAC5 (5.0V), VD (8.6V), and POW5 (5.0V) power sources.

SVC: Power source for SRAM (IC1702). Even if BU is cut off by diode switching, the charge voltage of C1704 (electrolytic capacitor) maintains SRAM's power supply for one day (minimum 2 V) and saves data of the ITS and title memories.

VDD: Power source for the microcomputer (IC1701). Constantly outputs power as long as the BU created by the IC power source PAJ002A is connected.

VLED: Power supply for the two LEDs for the elevation (vertical movement) sensor and disc sensor. The LEDs light during mechanical movement, and are controlled by LOAD.

5VA: Consists of power source for IC1001, IC1201 and the LD of the PU unit, plus the regulator circuit for IC1401 (XRA6797FP) and an external transistor. The 5VA power supply outputs power when VD is turned on.

DAC5: Consists of the IC1601 (D/A converter IC) and audio midpoint voltage, plus regulator IC from VD. The DAC5 power supply outputs power when VD is turned on.

VD: Main power supply for the system. Power is output when POW5, having switched VDD by POWER, reaches the reference voltage and is triggered.

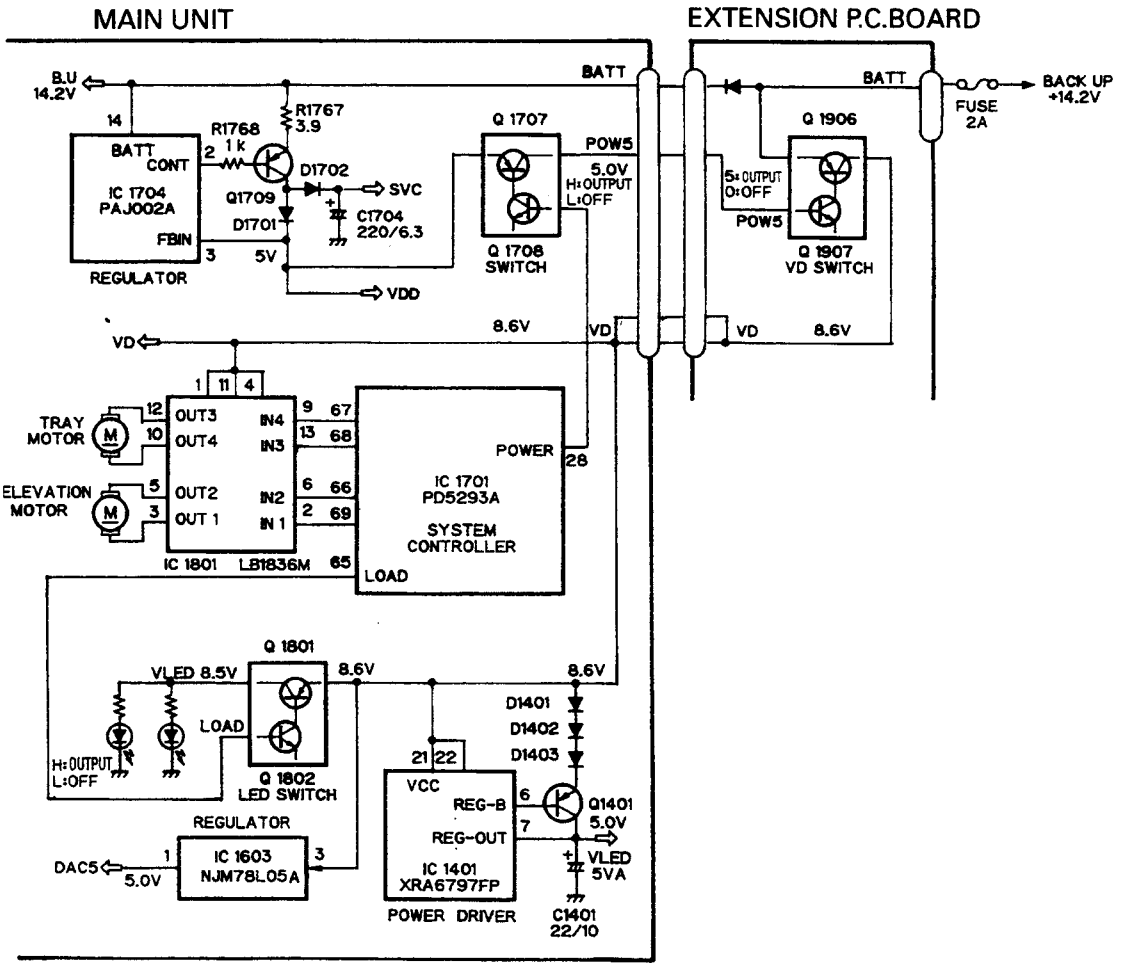



Fig.30

## 5.4 Mechanical Function

1) Elevation (Figure 31)

When BU is turned on, the elevator moves upward until RSTP becomes L. The elevator stops at L. This is the 6th position (reset position). While counting the number of L of TSEL, the elevator subsequently transfers to the position of the requested number of discs (place where TSEL is L). The TSEL waveform is detected by LED and photo transistor. MAG become L when the magazine is inserted. If there is no magazine, MAG becomes H. Even after magazine eject, the mechanism constantly detects the reset position and stops here.

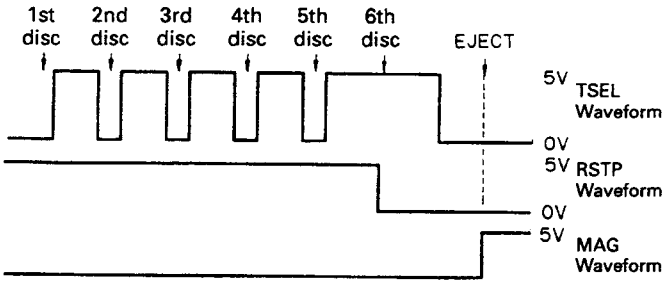



Fig.31

2) Tray extension and retreat (Figure 32)

The series of movements consisting of storing the tray in the magazine, extending and retreating the tray, and completion of clamping is determined by the microcomputer according to the DSP and TRP waveforms. The motors are driven by the 2-circuit motor drivers IC1801 (LB1836M) for locomoting the elevator and trays. Forward and reverse are carried out by drive instructions from the microcomputer through a combination of H and L of four lines (I1, I2, I3, I4).

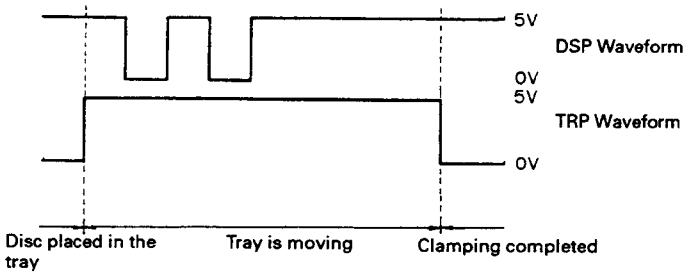



Fig.32

3) Disc detection (Figure 33)

DSP is not only used for the previously mentioned extension and retreat of trays, but is also used for timing of decisions of whether the tray contains a disc or not, and whether the disc is a 12 or 8 cm disc. A series of disc detection operations are carried out while trays are pulled out of the magazine. For disc detection, an LED and photo transistor are provided above and below the tray. Presence of the disc is determined according to whether the light passes through the tray (disc waveform is L) or is blocked by the disc (disc waveform is H).

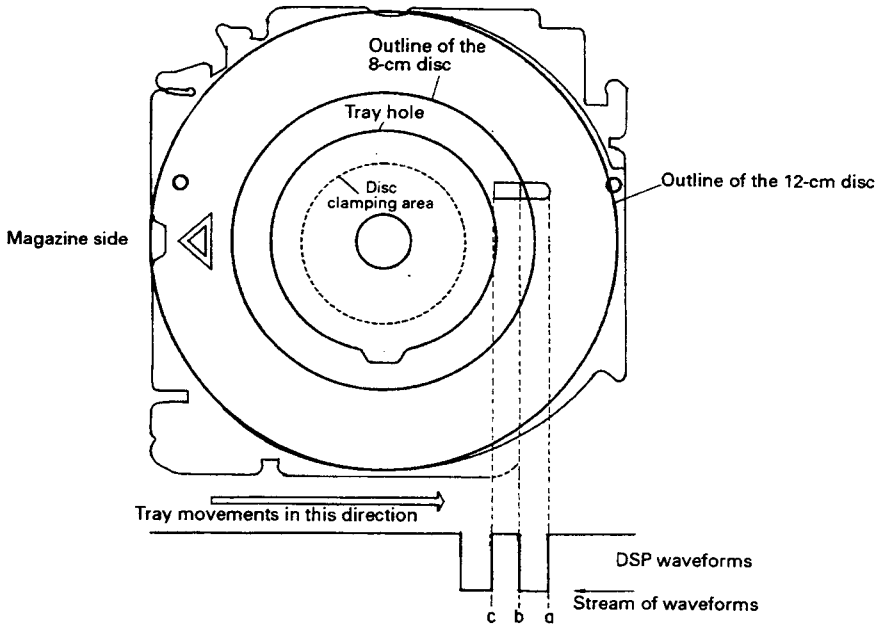



Fig.33

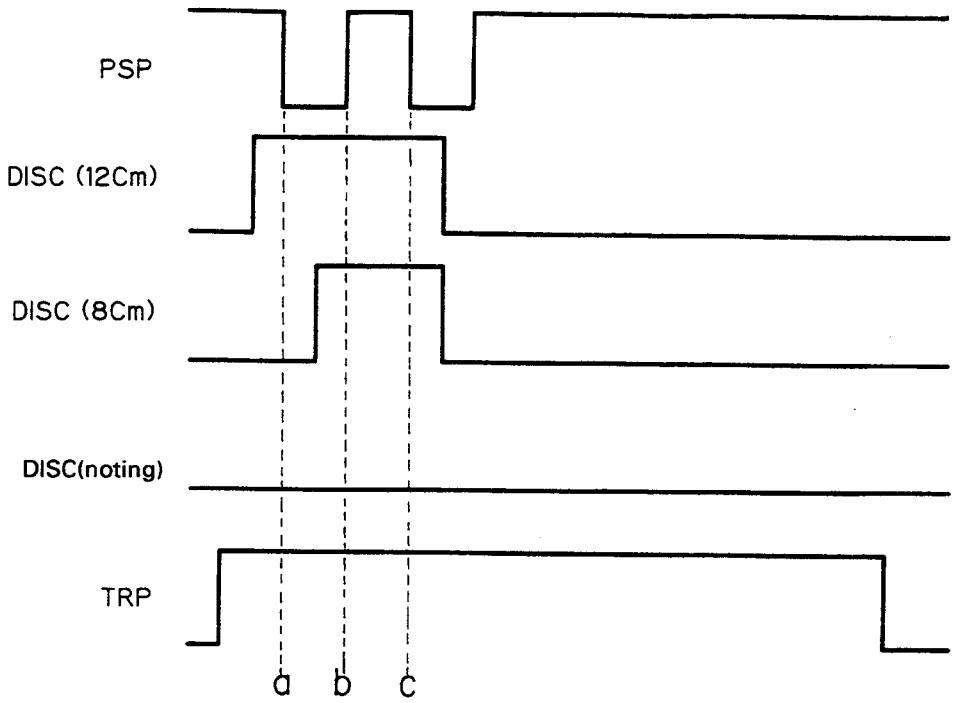



Fig.34

The flow of the waveform is opposite that of the previously mentioned DSP waveform.

Disc waveform is continuously detected during the periods of a-b and b-c:
If L is detected at least once, that period is L.
If L is not detected at least once, that period is H.

| | a-b | b-c |
|---|---|---|
| 12Cm | H | H |
| 8Cm | L | H |
| Disc (nothing) | L | L |

However, regardless of whether a-b is H or L, if b-c is L, all trays are determined to be empty.

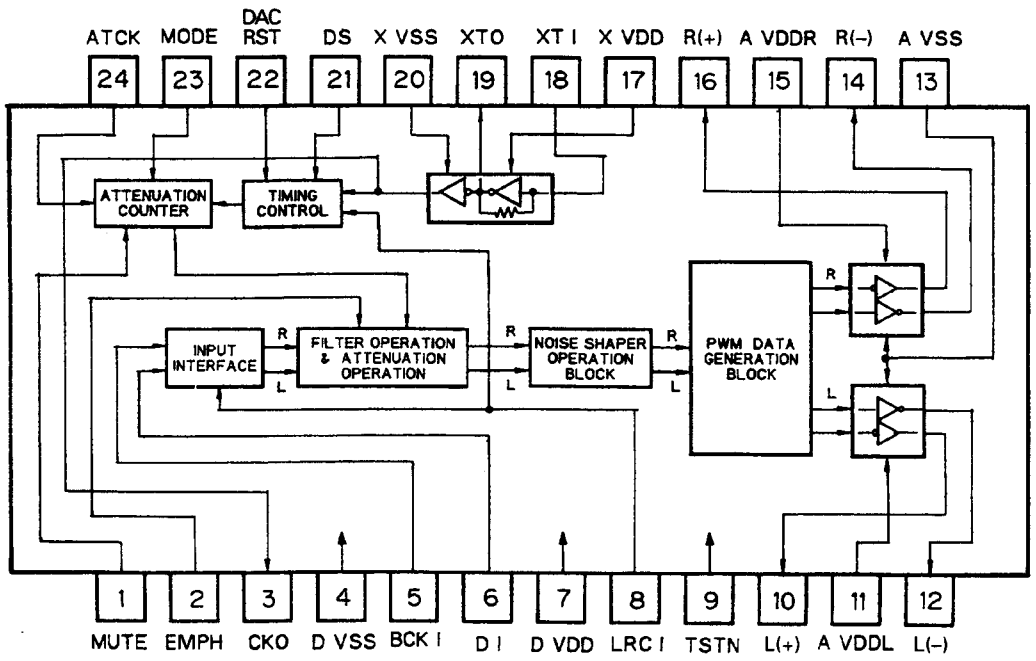
## ● ICs

## ● Pin Functions (SM5874AM)

| Pin No. | Pin Name | I/O | Function and Operation |
|---|---|---|---|
| 1 | MUTE | I | Mode H: Soft mute ON/OFF<br>Mode L: Attenuator level DOWN/UP |
| 2 | EMPH | I | De-emphasis ON/OFF terminal |
| 3 | CKO | O | Oscillation output clock |
| 4 | DVSS | | Digital GND (0V) |
| 5 | BCKI | I | Input data bit clock |
| 6 | DI | I | Serial data input |
| 7 | DVDD | | Digital VDD (5V) |
| 8 | LRCI | I | Input data sample rate (fs) clock |
| 9 | TSTN | I | Test |
| 10 | L(+) | O | Lch analogue output (+) |
| 11 | AVDDL | | Analogue VDD |
| 12 | L(–) | O | Lch analogue output (-) |
| 13 | AVSS | I | Analogue VSS |
| 14 | R(–) | O | Rch analogue output (-) |
| 15 | AVDDR | | Analogue VDD |
| 16 | R(+) | O | Rch analogue output (+) |
| 17 | XVDD | | Crystal VDD (5V) |
| 18 | XTI | I | Oscillation input |
| 19 | XTO | O | Oscillation output |
| 20 | XVSS | | Crystal VSS (0V) |
| 21 | DS | I | Normal / high-speed play mode select |
| 22 | DACRST | O | Reset output |
| 23 | MODE | I | Soft mute / attenuator mode select |
| 24 | ATCK | I | Attenuator level clock |

*IC's marked by* are MOS type.*
*Be careful in handing them because they are very liable to be damaged by electrostatic induction.*

*SM5874AM

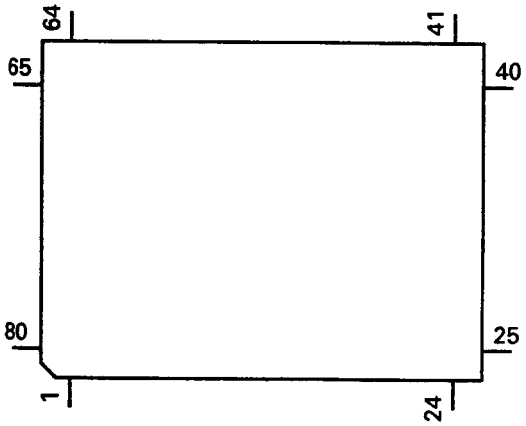


## ● Pin Functions (PD5293A)

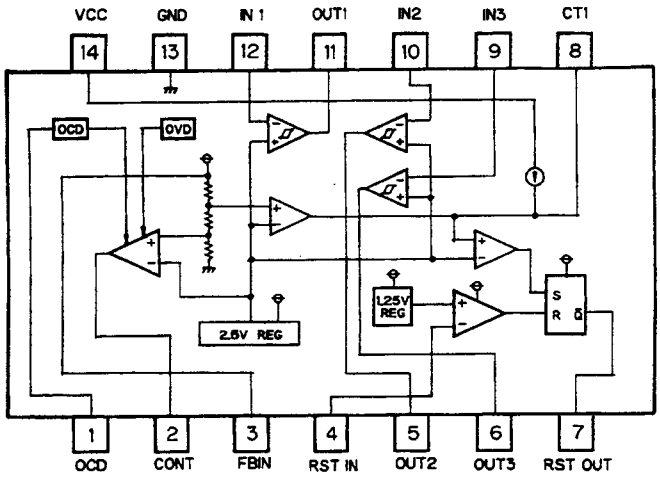
| Pin No. | Pin Name | I/O | I/O Format | Function and Operation |
|---|---|---|---|---|
| 1 | $\overline{TIN}$ | I | C | Tray position input |
| 2 | TEMP | I | | Temperature detector |
| 3 | VDIN | I | | Power supply short sensor input |
| 4 | $\overline{TOUT}$ | I | C | Disc sensor timing input |
| 5 | CSI | I | C | IP-BUS data input |
| 6 | CSO | O | C | IP-BUS data output |
| 7 | APPW | O | C | IP-BUS driver power supply control output |
| 8 | AO | O | C | Control signal distingshing from LSI |
| 9 | XSCK | I/O | C | LSI clock input/output |
| 10 | XSO | O | C | LSI data output |
| 11 | XSI | I | C | LSI data input |
| 12 | $\overline{STB}$ | O | C | LSI strobe output |
| 13 | $\overline{RST}$ | O | C | LSI reset output |
| 14 | $\overline{DCE}$ | O | C | Chip enable output |
| 15 | DACRST | O | C | D/A converter reset output |
| 16 | $\overline{ASENS}$ | I | | ACC power sense input |
| 17 | $\overline{BSENS}$ | I | | Back up power sense input |
| 18 | DMUTE | O | C | Mute output |
| 19 | $\overline{DRST}$ | O | C | Reset output |
| 20-23 | NC | | | Not used |
| 24 | $\overline{EJSW}$ | I | | Eject key switch interrupt input |
| 25 | $\overline{MAG}$ | I | | Magazine lock switch interrupt input |
| 26 | NC | | | Not used |
| 27 | $\overline{RESET}$ | I | | Reset input |
| 28 | POWER | O | C | CD +5V control |
| 29 | CONT | O | C | Servo driver power supply control |
| 30 | XIN | I | | Crystal oscillating element connection pin |
| 31 | XOUT | O | | Crystal oscillating element connection pin |
| 32 | VSS | | | GND |
| 33-40 | D7-D0 | I/O | C | External RAM data |
| 41 | $\overline{WE}$ | O | C | External RAM write enable |
| 42 | $\overline{PROT}$ | O | C | External RAM output enable |
| 43 | CS | O | C | External RAM chip select |
| 44-56 | A12-A0 | O | C | External RAM address |
| 57 | $\overline{EJP}$ | I | C | Reset position switch |
| 58,59 | NC | | | Not used |
| 60 | MIRR | I | C | Mirror detector input |
| 61 | LOCK | I | C | Spindle lock detector input |
| 62 | FOK | I | C | FOK signal input |
| 63 | $\overline{HOME}$ | I | C | Home position detector input |
| 64 | OPTSW | I | C | Digital output ON/OFF input |
| 65 | LOAD | O | C | Mechanism power supply control |
| 66 | I3 | O | C | Motor driver control output |
| 67 | I1 | O | C | Motor driver control output |
| 68 | I2 | O | C | Motor driver control output |
| 69 | I4 | O | C | Motor driver control output |
| 70 | CDMUTE | O | C | CD mute output |
| 71 | $\overline{ADENA}$ | O | C | A/D reference voltage output |
| 72 | $\overline{TESTIN}$ | I | C | Test program mode input |
| 73 | VCC | | | Back up 5V |
| 74 | VREF | I | | A/D converter reference voltage input |
| 75 | AVSS | I | | A/D GND |
| 76 | UNIT | I | | Unit input |
| 77 | $\overline{6/12}$ | I | C | 6/12 switching input |
| 78 | $\overline{DISK}$ | | | Disc detector input |
| 79 | $\overline{TSEL}$ | I | | Tray position detector photo sensor |
| 80 | $\overline{CSEL}$ | I | C | Compression select |

| I/O Format | Meaning |
|---|---|
| C | C MOS |

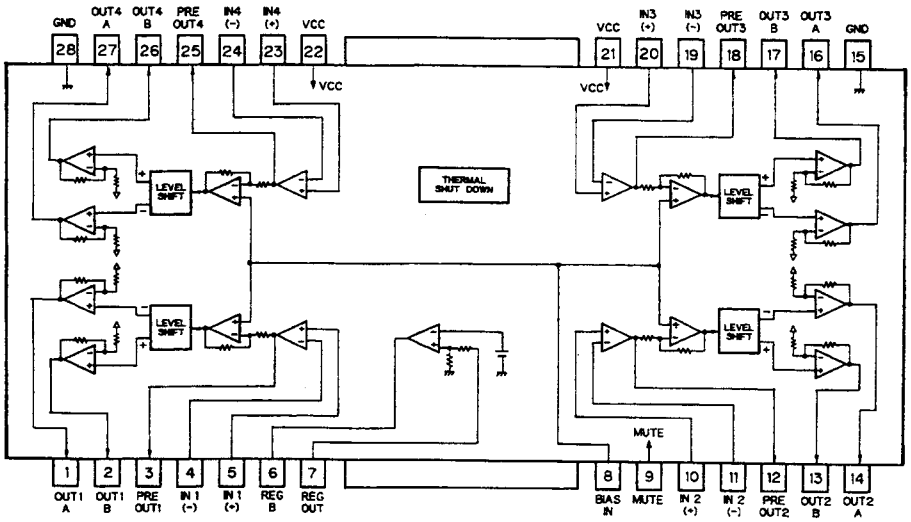
*PD5293A



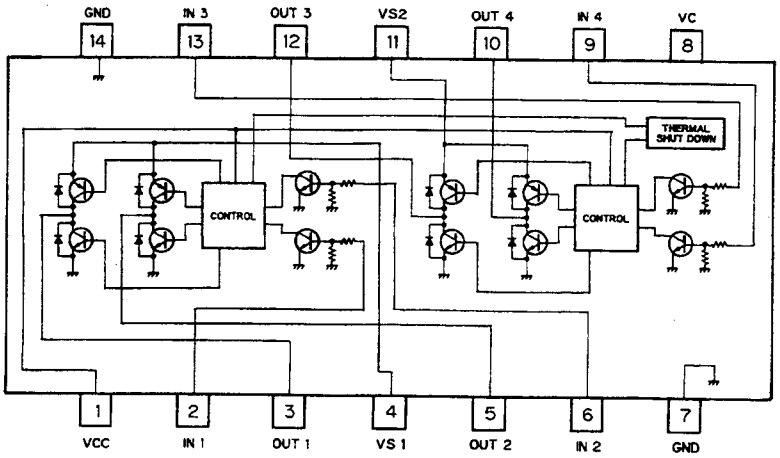

PAJ002A




XRA6797FP



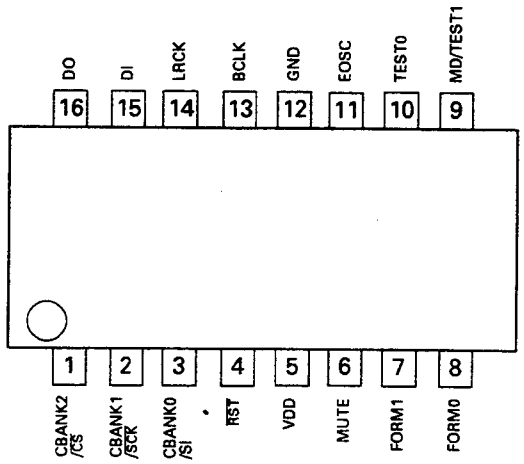

LB1836M



## ● Pin Functions (PD4501A)

| Pin No. | Pin Name | I/O | Function and Operation |
|---|---|---|---|
| 1 | CBNK2/$\overline{CS}$ | I | CROM bank select signal input/Chip select |
| 2 | CBNK1/$\overline{SCK}$ | I | CROM bank select signal input/Clock |
| 3 | CBNK0/SI | I | CROM bank select signal input/Data |
| 4 | $\overline{RST}$ | I | Reset signal input |
| 5 | VDD | | Power supply |
| 6 | MUTE | I | Mute control input |
| 7 | FORM1 | I | Bit clock rate select signal input |
| 8 | FORM0 | I | Bit clock rate select signal input |
| 9 | MD/TEST1 | I | CROM bank select /test mode select |
| 10 | TEST0 | I | Test mode select |
| 11 | EOSC | I | External clock input |
| 12 | GND | | GND |
| 13 | BCLK | I | Bit clock signal input |
| 14 | LRCK | I | L/R clock signal input |
| 15 | DI | I | Audio data serial input |
| 16 | DO | O | Audio data serial output |

*PD4501A (CDX-P616)



# 6. EXPLODED VIEW PARTS LIST

**NOTE:**

- Parts marked by "✱"are generally unavailable because they are not in our Master Spare Parts List.
- Parts marked by "◉"are not always kept in stock. Their delivery time may be longer than usual or they may be unavailable.
- **Chassis(Exploded View:Page 2-7)**

- **Parts List**

| Mark No. | Description | Part No. |
|---|---|---|
| 1 | Screw | BMZ26P080FMC |
| 2 | Screw | BSZ30P055FZK |
| 3 | Cord (P616/UC,P610/UC,ES) | CDE4211 |
| | Cord (P610/EW,X1B/EW) | CDE4210 |
| 4 | Connector | CDE4372 |
| 5 | Upper Case | CNB1886 |
| 6 | Lower Case | CNB1815 |
| 7 | Insulator | CNM3987 |
| 8 | Main Unit(P616) | CWX1761 |
| | Main Unit(P610) | CWX1721 |
| 9 | Extension Unit | CWX1729 |
| 10 | CD Mechanism Unit | CXK4000 |
| 11 | Screw | PMS26P040FMC |
| 12 | Earth Plate | CNC5769 |
| 13 | Screw | HMF40P080FZK |
| 14 | ····· | |
| 15 | Angle | CNB1874 |
| 16 | ····· | |
| 17 | Connector(CN1701) | CKS2764 |
| 18 | Connector(CN1801) | CKS2779 |
| 19 | Connector(CN1802) | CKS3127 |
| 20 | Heat Sink | CNC4447 |
| 21 | Connector Bracket | CNC5570 |
| 22 | Connector(CN1697) | CKS2218 |
| 23 | Connector(CN1699) | CKS2479 |
| 24 | Plug(CN1901) | CKS-460 |
| 25 | Transistor(Q1906) | 2SB942 |
| 26 | Screw | BPZ26P080FMC |
| 27 | Button | CAC3982 |
| 28 | Door(P616) | CAT1650 |
| | Door(P610) | CAT1624 |
| 29 | Holder | CNC5362 |
| 30 | Grille Unit(P616) | CXA7758 |
| | Grille Unit(P610) | CXA7757 |
| 31 | Connector | CDE4366 |

● **CD Mechanism Unit(Exploded View:Page 2-4)**

● **Parts List**

| Mark No. | Description | Part No. |
|---|---|---|
| 1 | Screw | BMZ20P030FMC |
| 2 | Screw | BMZ20P025FMC |
| 3 | Screw(M2.6×3) | CBA1065 |
| 4 | LED | BR4361F |
| 5 | ····· | |
| 6 | Screw | CBA1041 |
| 7 | Screw | CBA1077 |
| 8 | Screw | CBA1086 |
| 9 | Screw | CBA1229 |
| 10 | Screw | CBA1243 |
| 11 | Washer | CBF1038 |
| 12 | Spring | CBH1488 |
| 13 | Spring | CBH1497 |
| 14 | Spring | CBH1498 |
| 15 | ····· | |
| 16 | Spring | CBH1588 |
| 17 | Spring | CBH1589 |
| 18 | Spring | CBH1744 |
| 19 | Spring | CBH1592 |
| 20 | Spring | CBH1593 |
| 21 | Spring | CBH1594 |
| 22 | Spring(Silver) | CBH1596 |
| 23 | Spring | CBH1597 |
| 24 | Spring | CBH1599 |
| 25 | Spring | CBH1604 |
| 26 | Spring | CBH1605 |
| 27 | Spring(Silver) | CBH1606 |
| 28 | Spring(Brown) | CBH1607 |
| 29 | Spring | CBH1631 |
| 30 | Spring(Black) | CBH1633 |
| 31 | Spring | CBH1667 |
| 32 | Spring | CBH1706 |
| 33 | Spring | CBH1721 |
| 34 | Spring | CBL1157 |
| 35 | Arm | CBL1186 |
| 36 | Arm | CBL1187 |
| 37 | Spring | CBL1210 |
| 38 | Connector | CDE4244 |
| 39 | ····· | |
| 40 | PU Unit | CGY1036 |
| 41-44 | ····· | |
| 45 | Shaft | CLA2027 |
| 46 | Shaft | CLA2322 |
| 47 | Shaft | CLA2345 |
| 48 | Link | CNC5150 |
| 49 | Lever | CNC5166 |
| 50 | Arm | CNC5168 |
| 51 | Arm | CNC5169 |
| 52 | Bracket | CNC5170 |
| 53 | CM Bracket | CNC5171 |
| 54 | Cover | CNC5172 |
| 55 | Upper Frame | CNC5175 |
| 56 | Main Frame | CNC5176 |
| 57 | Side Frame | CNC5178 |
| 58 | Bracket | CNC5462 |
| 59 | Cover | CNC5567 |
| 60 | Cover | CNC5576 |
| 61 | Lever | CNC5678 |
| 62 | Plate | CNC5782 |
| 63 | Spacer | CNM1787 |
| 64 | Sheet | CNM3897 |
| 65 | Sheet | CNM4337 |
| 66 | Insulator | CNM4266 |
| 67 | P.C.Board | CNP3642 |
| 68 | P.C.Board | CNP3730 |
| 69 | Belt | CNT1047 |
| 70 | Rack | CNV3355 |
| 71 | Holder | CNV3363 |
| 72 | Gear | CNV3753 |
| 73 | Gear | CNV3754 |
| 74 | Guide | CNV3756 |
| 75 | Arm | CNV3757 |
| 76 | Arm | CNV3758 |
| 77 | Arm | CNV4185 |
| 78 | Worm Wheel | CNV3761 |
| 79 | Gear | CNR1382 |
| 80 | Gear | CNV3763 |
| 81 | Gear | CNV3764 |
| 82 | Gear | CNV3765 |
| 83 | Gear | CNV3766 |
| 84 | Gear | CNV3767 |
| 85 | Arm | CNV3769 |
| 86 | Guide | CNV3770 |
| 87 | Guide | CNV3771 |
| 88 | Guide | CNV3772 |
| 89 | Guide | CNV3773 |
| 90 | Arm | CNV3775 |
| 91 | Bearing | CNV3778 |
| 92 | Holder | CNV3779 |
| 93 | Damper | CNV3780 |

| Mark No. | Description | Part No. |
|---|---|---|
| 94 | Cam | CNV3781 |
| 95 | Guide | CNV3784 |
| 96 | Guide | CNV3785 |
| 97 | Arm | CNV3787 |
| 98 | Plate | CNV3912 |
| 99 | Arm | CNV3914 |
| 100 | Composite P.C.Board | CNX2236 |
| 101 | ····· | |
| 102 | Composite P.C.Board | CNX2237 |
| 103 | ····· | |
| 104,105 | ····· | |
| 106 | Switch(S802-805) | CSN1012 |
| 107 | Switch(S801) | CSN1029 |
| 108 | P.C.Board Unit | CWX1809 |
| 109 | Connector(6P) | CKS1944 |
| 110 | Connector(17P) | CKS1955 |
| 111 | Connector(30P) | CKS1968 |
| 112 | Connector(7P) | CKS2406 |
| 113 | Motor Unit(M804) | CXA4649 |
| 114 | Damper Unit | CXA6443 |
| 115 | Stage Chassis Unit | CXA6608 |
| 116 | CRG Chassis Unit | CXA6609 |
| 117 | Steer Unit | CXA6610 |
| 118 | Bracket Unit | CXA6611 |
| 119 | Magazine Holder Unit | CXA6612 |
| 120 | Lever Unit | CXA6613 |
| 121 | Lower Cover Unit | CXA6614 |
| 122 | Bracket Unit | CXA6615 |
| 123 | Cam Ring Unit | CXA6616 |
| 124 | Lever Unit | CXA6619 |
| 125 | Lever Unit | CXA6620 |
| 126 | Link Unit | CXA6621 |
| 127 | Arm Unit | CXA6622 |
| 128 | Arm Unit | CXA6623 |
| 129 | Arm Unit | CXA6624 |
| 130 | Frame Unit | CXA6625 |
| 131 | Lever Unit | CXA6626 |
| 132 | Motor Unit(M803) | CXA6977 |
| 133 | Motor Unit(M802) | CXA6978 |
| 134 | Screw Unit | CXA6990 |
| 135 | Motor Unit(M801) | CXA6991 |
| 136 | Arm Unit | CXA7153 |
| 137 | ····· | |
| 138 | Clamper Unit | CXA7632 |
| 139,140 | ····· | |
| 141 | Screw | JFZ17P025FNI |
| 142 | Screw | JFZ20P025FNI |
| 143 | Photo-transistor (P801,802) | PT4800 |
| 144 | Spring | CBH1741 |
| 145 | Screw | JFZ20P014FMC |
| 146 | Washer | CBF1002 |

# 7. ELECTRICAL PARTS LIST

**NOTE:**

- Parts whose parts numbers are omitted are subject to being not supplied.
- The part numbers shown below indicate chip components.

Chip Resistor

RS1/OSOOOJ,RS1/OOSOOOJ

Chip Capacitor (except for CQS.....)

CKS....., CCS....., CSZS.....

| =====Circuit Symbol & No. Part Name===== | | Part No. |
|---|---|---|
| Unit Number : | | |
| Unit Name : Extension P.C.Board | | |
| MISCELLANEOUS | | |
| Q 1693 1697 | | DTA144ES |
| Q 1696 | | DTC114YS |
| Q 1698 1699 | | DTC343TS |
| Q 1799 | | 2SC2458 |
| Q 1906 | | 2SB942 |
| Q 1907 1908 | | 2SD1859 |
| D 1698 1699 | | 1SS133 |
| D 1798 1799 | | RD18JSB1 |
| D 1901 1903 | | ERA15-02VH |
| L 1901 | Choke Coil | CTH1129 |
| SW1799 | Switch(Adress) | CSH1038 |
| RESISTORS | | |
| R 1695 1910 | | RD1/4PS103JL |
| R 1696 1697 | | RD1/4PS332JL |
| R 1698 1699 | | RD1/4PS112JL |
| R 1791 | | RD1/4PS102JL |
| R 1792 1793 1794 | | RD1/4PS513JL |
| R 1795 1796 1908 | | RD1/4PS101JL |
| R 1798 | | RD1/4PS273JL |
| R 1799 | | RD1/4PS433JL |
| R 1906 | | RD1/4PS104JL |
| R 1907 | | RD1/4PS204JL |
| R 1909 1911 | | RD1/4PS201JL |
| R 1912 | | RD1/4PS241JL |
| R 1913 | | RD1/4PS681JL |
| R 1914 | | RD1/4PS511JL |
| R 1915 | | RD1/4PS104JL |
| CAPACITORS | | |
| C 1698 1699 | | CEA330M10LL |
| C 1798 1799 | | CKPYB471K50L |
| C 1901 1905 | 470μF/16V | CCH1183 |
| C 1904 | | CEA220M10LL |
| C 1906 | 470μF/16V | CCH1183 |
| C 1907 | | CKPYB102K50L |
| Unit Number : CWX1761(CDX-P616/UC) | | |
| Unit Name : Main Unit | | |
| MISCELLANEOUS | | |
| IC 1001 | | UPC2571GS |
| IC 1201 | | UPD63700GF |
| IC 1301 | | PD4501A |
| IC 1401 | | XRA6797FP |
| IC 1601 | | SM5874AM |
| IC 1602 | | XRA4560F |
| IC 1603 | | NJM78L05A |
| IC 1701 | | PD5293A |
| IC 1702 | | LH5160HN-10L |
| IC 1703 | | PA0051AM |

| =====Circuit Symbol & No. Part Name===== | | Part No. |
|---|---|---|
| IC 1704 | | PAJ002A |
| IC 1801 | | LB1836M |
| Q 1001 | | 2SA1015 |
| Q 1401 1709 | | 2SB1238 |
| Q 1701 | | DTA144ES |
| Q 1703 | | DTC144ES |
| Q 1704 1707 1801 | | DTA123JS |
| Q 1708 1802 | | DTC114YS |
| D 1401 1402 1403 | | ERA15-02VH |
| D 1701 1702 | | 1SS292 |
| X 1601 | Resonator 16.9340MHz | CSS1328 |
| X 1701 | Ceramic Resonator | CSS1310 |
| S 1701 1702 | Switch(EJECT,RESET) | CSG1059 |
| VR1001 | Semi-fixed 2.2kΩ(B) | CCP1177 |
| VR1002 | Semi-fixed 22kΩ(B) | CCP1183 |
| VR10031004 | Semi-fixed 47kΩ(B) | CCP1185 |
| RESISTORS | | |
| R 1001 | | RD1/4PS220JL |
| R 1002 | | RD1/4PS0R0JL |
| R 1003 | | RD1/4PS103JL |
| R 1004 1768 | | RS1/16S102J |
| R 1005 | | RS1/16S823J |
| R 1006 | | RS1/16S182J |
| R 1007 | | RS1/16S333J |
| R 1011 1012 | | RS1/16S683J |
| R 1013 1024 1025 | | RD1/4PS102JL |
| R 1014 1410 | | RS1/16S473J |
| R 1018 | | RD1/4PS622JL |
| R 1019 1401 1407 1716 | | RS1/16S563J |
| R 1020 | | RS1/16S622J |
| R 1021 1701 | | RS1/16S513J |
| R 1022 1408 | | RS1/16S133J |
| R 1027 | | RS1/16S183J |
| R 1028 | | RS1/16S822J |
| R 1201 1406 1411 1605 1606 1607 1608 1702 1712 1741 | | RS1/16S103J |
| R 1402 1403 1613 1614 1615 1616 | | RS1/16S163J |
| R 1404 | | RS1/16S753J |
| R 1405 1708 | | RS1/16S433J |
| R 1409 | | RS1/16S153J |
| R 1412 | | RS1/16S152J |
| R 1602 | | RS1/16S471J |
| R 1609 1610 1611 1612 | | RS1/16S752J |
| R 1617 1618 1769 | | RS1/16S101J |
| R 1619 | | RS1/16S102J |
| R 1704 | | RS1/16S154J |
| R 1705 1713 1715 1718 1721 1730 1731 1732 1733 1734 | | RS1/16S104J |
| R 1707 | | RS1/16S0R0J |
| R 1709 1710 1714 1722 1729 1735 1744 1745 | | RS1/16S222J |
| R 1717 | | RS1/16S123J |
| R 1719 1742 1766 | | RS1/16S0R0J |
| R 1737 1738 1739 | | RS1/16S104J |
| R 1747 1748 | | RS1/16S104J |

| =====Circuit Symbol & No. Part Name===== | | Part No. |
|---|---|---|
| R 1756 | | RS1/16S104J |
| R 1767 | | RD1/4PS3R9JL |
| R 1771 | | RS1/16S102J |
| R 1801 1802 | | RD1/4PS391JL |
| CAPACITORS | | |
| C 1001 1008 1010 1011 1708 1709 | | CKSRYB102K50 |
| C 1002 | | CEA101M6R3LL |
| C 1003 1021 1602 1603 1604 1605 | | CKSQYB104K16 |
| C 1004 | | CEA470M6R3LL |
| C 1005 | | CCSRCH101J50 |
| C 1006 1023 | | CKSRYB561K50 |
| C 1007 | | CKSYB334K16 |
| C 1009 | | CCSRCH181J50 |
| C 1013 1301 1701 1702 1705 1707 | | CKSRYB103K25 |
| C 1014 | | CCSRCH220J50 |
| C 1015 1201 1202 | | CKSYF105Z16 |
| C 1018 | | CEA220M6R3LL |
| C 1022 | | CKSRYB332K50 |
| C 1026 | | CKSRYB103K25 |
| C 1203 | | CKSRYB471K50 |
| C 1302 | | CEA470M6R3LL |
| C 1401 | | CSZA220M10 |
| C 1402 | | CKSQYB103K50 |
| C 1403 | | CKSQYB153K50 |
| C 1404 1405 | | CEAS221M10 |
| C 1406 1407 | | CKSRYB152K50 |
| C 1408 | | CKSRYB271K50 |
| C 1606 1607 | | CCSRCH470J50 |
| C 1608 | | CEA101M6R3LL |
| C 1609 1610 | | CCSRCH221J50 |
| C 1611 1612 1613 1614 | | CCSRCH680J50 |
| C 1616 | | CKSYB224K16 |
| C 1617 1618 | | CKSRYB103K25 |
| C 1703 | | CASA330M10 |
| C 1704 | | CEA221M6R3LL |
| C 1706 | | CKSRYB103K50 |
| C 1710 | | CKSRYB103K25 |
| C 1802 | | CEA220M16LL |

Unit Number : CWX1721(CDX-P610/UC,EW,X1B/EW,ES)
Unit Name : Main Unit

MISCELLANEOUS

| | | |
|---|---|---|
| IC 1001 | | UPC2571GS |
| IC 1201 | | UPD63700GF |
| IC 1401 | | XRA6797FP |
| IC 1601 | | SM5874AM |
| IC 1602 | | XRA4560F |
| IC 1603 | | NJM78L05A |
| IC 1701 | | PD5293A |
| IC 1702 | | LH5160HN-10L |
| IC 1703 | | PA0051AM |
| IC 1704 | | PAJ002A |
| IC 1801 | | LB1836M |
| Q 1001 | | 2SA1015 |
| Q 1401 1709 | | 2SB1238 |
| Q 1701 | | DTA144ES |
| Q 1703 | | DTC144ES |
| Q 1704 1707 1801 | | DTA123JS |
| Q 1708 1802 | | DTC114YS |
| D 1401 1402 1403 | | ERA15-02VH |
| D 1701 1702 | | 1SS292 |
| X 1601 | Resonator 16.9340MHz | CSS1328 |
| X 1701 | Ceramic Resonator | CSS1310 |
| S 1701 1702 | Switch(EJECT,RESET) | CSG1059 |
| VR 1001 | Semi-fixed 2.2kΩ(B) | CCP1177 |
| VR 1002 | Semi-fixed 22kΩ(B) | CCP1183 |
| VR 1003 1004 | Semi-fixed 47kΩ(B) | CCP1185 |

| =====Circuit Symbol & No. Part Name===== | Part No. |
|---|---|
| RESISTORS | |
| R 1001 | RD1/4PS220JL |
| R 1002 | RD1/4PS0R0JL |
| R 1003 | RD1/4PS103JL |
| R 1004 1768 | RS1/16S102J |
| R 1005 | RS1/16S823J |
| R 1006 | RS1/16S182J |
| R 1007 | RS1/16S333J |
| R 1011 1012 | RS1/16S683J |
| R 1013 1024 1025 | RD1/4PS102JL |
| R 1014 1410 | RS1/16S473J |
| R 1018 | RD1/4PS622JL |
| R 1019 1401 1407 1716 | RS1/16S563J |
| R 1020 | RS1/16S622J |
| R 1021 1701 | RS1/16S513J |
| R 1022 1408 | RS1/16S133J |
| R 1027 | RS1/16S183J |
| R 1028 | RS1/16S822J |
| R 1201 1406 1411 1605 1606 1607 1608 1702 1712 1741 | RS1/16S103J |
| R 1402 1403 1613 1614 1615 1616 | RS1/16S163J |
| R 1404 | RS1/16S753J |
| R 1405 1708 | RS1/16S433J |
| R 1409 | RS1/16S153J |
| R 1412 | RS1/16S152J |
| R 1601 | RS1/16S0R0J |
| R 1602 | RS1/16S471J |
| R 1609 1610 1611 1612 | RS1/16S752J |
| R 1617 1618 1769 | RS1/16S101J |
| R 1619 | RS1/16S102J |
| R 1704 | RS1/16S154J |
| R 1705 1713 1715 1718 1721 1730 1731 1732 1733 1734 | RS1/16S104J |
| R 1706 | RS1/16S104J |
| R 1709 1710 1714 1722 1729 1735 1744 1745 | RS1/16S222J |
| R 1717 | RS1/16S123J |
| R 1719 1742 1766 | RS1/16S0R0J |
| R 1737 1738 1739 | RS1/16S104J |
| R 1747 1748 | RS1/16S104J |
| R 1756 | RS1/16S104J |
| R 1767 | RD1/4PS3R9JL |
| R 1771 | RS1/16S102J |
| R 1801 1802 | RD1/4PS391JL |
| CAPACITORS | |
| C 1001 1008 1010 1011 1708 1709 | CKSRYB102K50 |
| C 1002 | CEA101M6R3LL |
| C 1003 1021 1602 1603 1604 1605 | CKSQYB104K16 |
| C 1004 | CEA470M6R3LL |
| C 1005 | CCSRCH101J50 |
| C 1006 1023 | CKSRYB561K50 |
| C 1007 | CKSYB334K16 |
| C 1009 | CCSRCH181J50 |
| C 1013 1701 1702 1705 1707 | CKSRYB103K25 |
| C 1014 | CCSRCH220J50 |
| C 1015 1201 1202 | CKSYF105Z16 |
| C 1018 | CEA220M6R3LL |
| C 1022 | CKSRYB332K50 |
| C 1026 | CKSRYB103K25 |
| C 1203 | CKSRYB471K50 |
| C 1401 | CSZA220M10 |
| C 1402 | CKSQYB103K50 |
| C 1403 | CKSQYB153K50 |
| C 1404 1405 | CEAS221M10 |
| C 1406 1407 | CKSRYB152K50 |
| C 1408 | CKSRYB271K50 |
| C 1606 1607 | CCSRCH470J50 |
| C 1608 | CEA101M6R3LL |
| C 1609 1610 | CCSRCH221J50 |
| C 1611 1612 1613 1614 | CCSRCH680J50 |

| =====Circuit Symbol & No. Part Name===== | | Part No. |
|---|---|---|
| C 1616 | | CKSYB224K16 |
| C 1617 1618 | | CKSRYB103K25 |
| C 1703 | | CASA330M10 |
| C 1704 | | CEA221M6R3LL |
| C 1706 | | CKSRYB103K50 |
| C 1710 | | CKSRYB103K25 |
| C 1802 | | CEA220M16LL |

Unit Number :
Unit Name : P.C.Board

| | | |
|---|---|---|
| C 801 802 | | CKSQYB561K50 |

Unit Number :
Unit Name : Mechanism P.C.Board

| | | |
|---|---|---|
| D 802 | LED | BR4361F |
| S 805 | Switch(Home) | CSN1012 |

Unit Number :
Unit Name : Photo P.C.Board

| | | |
|---|---|---|
| D 801 | LED | BR4361F |
| S 801 | Switch(RSTP) | CSN1025 |
| S 802 | Switch(MAG) | CSN1012 |

Miscellaneous Parts List

| | | |
|---|---|---|
| | PU Unit | CGY1036 |
| M 802 | Motor Unit(ELV) | CXA6978 |
| M 803 | Motor Unit(Tray) | CXA6977 |
| M 801 | Motor Unit(Spindle) | CXA6991 |
| M 804 | Motor Unit(Carriage) | CXA4649 |
| P 801 802 | Photo-Transistor | PT4800 |
| S 803 804 | Switch(TRP,DSP) | CSN1012 |